Magazine of the National Professional Engineer

American Engineer

DECEMBER 1958

The Kariba Project: Huge Dam in Africa

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The Classics of Engineering Literature by Walter James Miller

• • •

Plus These Special News Sections:

- *Consulting*
- *Education*
- *Government*
- *Industry*

Asphalt at Chicago Airport

The Asphalt Institute

Massachusetts Turnpike

Three-Fold Program At The Asphalt Institute Meets Industry's Needs

New Literature

MATERIALS HANDLING – A 2-page, fully-illustrated article describing methods of selecting the correct materials handling equipment to achieve maximum space, time and manpower savings is among the features of the fall issue of the Lewis-Shepard *Lever*. The 16-page magazine, especially prepared for companies and individuals interested in materials handling, also carries a semi-technical article on the science of hydraulics as applied to fork lift trucks. Other features of the magazine include case studies on the profitable application of modern materials handling equipment in a wide range of industries. Each of the studies is illustrated by a series of actual installation photos.

(Circle 15 in Readers' Service Dept.)

ELECTRICAL EQUIPMENT—"An Electrical Engineer Comes to Crouse-Hinds" is the title of a new 6-page folder by Crouse-Hinds. The bulletin describes design and construction principles involved in manufacturing Crouse-Hinds Condulet electrical equipment for hazardous locations. Also emphasized is the great variety of explosion-proof equipment in everything from lighting to motor controls.

(Circle 16 in Readers' Service Dept.)

CEMENTED CARBIDES—A new catalog, "Cemented Carbides for Industry" is being distributed by Carmet, the carbide producing division of Allegheny Ludlum Steel Corp. The 32-page booklet includes, for the first time, all material that previously had been in five separate Carmet booklets. Included in the material is a new simplified pricing system, which makes it easier for the customer to determine prices. A new Carmet cutting grade—CA-604—is listed for the first time in any catalog. In addition, the catalog has a new technical section which features six special charts on the proper feeds, speeds and grades of carbide materials to use on various cutting operations.

(Circle 17 in Readers' Service Dept.)

ARCHITECTS MANUAL—Fully illustrated data on design and building requirements, features and advantages, and a list of current installations in twenty-eight states fill fifty pages in the

Architects Manual on newly-improved Barcol Wardrobedoors, by Barber-Colman Company. New precision-engineering features are described, providing easy operation, sturdy writing surface for pupils using chalkboard. New honeycomb-core hardboard sandwich construction is also described.

(Circle 18 in Readers' Service Dept.)

ENGINEERING PARTS—Unistrut Products Co. has published a new and greatly expanded General Engineering Parts catalog on its all-purpose bolted metal framing system. The colorful, 180-page publication, featuring a simplified self-indexing system, is arranged for quick reference and easy ordering. Fundamental features of the unique product are pointed out, as well as clear-cut illustrations of over 1,400 fittings. Abundant illustrations and explanatory notes aid identification of parts. Along with a complete listing of all the system's 1,400 fittings, channel members and other parts, two pages are devoted to showing typical Unistrut applications. Among the important additions to this latest book are three basic sections listing all channel width specifications. In the first, 126 pages are given to the heavy duty 1⅝" series; sixteen pages in the second section describe the medium duty 1¼" series, and the last has twenty-four pages on the lighter duty 13/16" group.

(Circle 19 in Readers' Service Dept.)

TRUCK-CRANE—The Construction Equipment Division of Baldwin-Lima-Hamilton Corporation announces the availability of an 8-page catalog illustrating and describing the new Lima Type 64-T 50-ton capacity truck crane. The catalog highlights the design and operating features of the four axle truck crane. Illustrated and described in the catalog is the Lima designed carrier construction, "pin-on" type front and rear outrigger boxes, hydraulic power steering, compact heavy-duty rotating assembly, independent planetary boom hoist, main machinery, folding gantry and pin connected boom.

(Circle 20 in Readers' Service Dept.)

MOBILE LABORATORY—Engineering testing programs for soils explorations, soils studies and quality control of concrete and asphalt can be carried out with a line of mobile testing laboratories described in a brochure announced by Soiltest, Inc. This should be of interest to state and county highway departments, consulting engineers, testing laboratories, research groups and industry. The brochure is profusely illustrated showing the latest laboratory layouts and combinations of testing equipment, and breaks down component testing systems and various test apparatus for soils, concrete and asphalt. The brochure contains illustrations and diagrams as well as groupings of the apparatus needs to perform various ASTM tests in all three fields.

(Circle 21 in Readers' Service Dept.)

V BELT DRIVES—A 12-page illustrated manual, "How to Get Longer Life from V Belt Drives," has been issued by B. F. Goodrich Industrial Products Co. The manual tells how to select and install V belts, how to detect V belt trouble, diagnose belt failures, correct drive troubles. A list of valuable tips for proper V belt maintenance is included as well as a suggested inventory survey check list for V belt drives.

(Circle 22 in Readers' Service Dept.)

These listings are informational only and are not an endorsement of the products, nor of the manufacturer's claims. To receive any of the new literature described in this column, merely circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

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NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
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Letters to the Editor

Federal Pay . . .

Dear Editor:

In recent months, much publicity has been given to the much-needed and long-awaited general pay increase for Civil Service employees of the United States Government. Prior to the increase, many studies had been made of the subject, both by independent agencies and also by the Federal agencies affected. Most of these studies concluded that, in essence, not since the depression years of the 1930's has government service been financially desirable. Since the outbreak of World War II, the government has been fighting a losing battle with private industry in the realm of pay offered and even in its former stronghold of fringe benefits. The findings of these various committees, then, formed the basis for the new pay scales as adopted by Congress and signed by the President.

How many people, I wonder, are aware of the net result of this pay bill on the salary of engineers and scientists in the employ of the U.S. Government? Whereas formerly all engineers and scientists hired or promoted by the U.S. were put in the top pay rate in their grade, by a new Civil Service Commission ruling they are now put in the third step in their grade. This means that in this age of technocracy, when news of sputniks, ICBM's, etc. dominates every newspaper in the world, when the U.S. Government needs to hire the cream of the country's graduating engineers and scientists and needs to fill its top engineering positions with the best technical minds available, the Government has *reduced* its already meager pay for engineers hired in the lower grades and has increased the pay for scientific personnel hired in or promoted to the higher grades by an insignificant one or two per cent. This occurred at the same time that salaries of clerks, messenger boys, etc., in Government employ were increased by a flat ten per cent.

Either the authorities feel that there is no need to attract and retain top-notch scientific personnel in Government service or else they are being alarmingly penny-pinching at a time when the U.S. can ill afford it. Maybe 100 years ago, the U.S. could have taken a breather in its scientific development but this is 1958.

RICHARD FAUBEL, EIT
Cleveland, Ohio

► **Editor's Note: See related story on page 11.**

New AE Format . . .

I like the new format. . . .

HENRY L. BEST, P.E.
Indianapolis, Ind.

Congratulations on the much needed, improved Readers' Service Card!

M. W. WASELL, P.E.
Winston-Salem, N. C.

Thanks for the Readers' Service Card. . . .

W. C. COTTEN, JR., P.E.
Austin, Tex.

New format very well received. . . .

E. BRUZEL, P. E.
Morristown, N. J.

Happy to see improvements in magazine. . . .

WILLIAM H. AUSTIN, P.E.
Cheshire, Conn.

Congratulations on an outstanding new format for AE. I'm sure it will stimulate all members and help impress prospects.

ED LOWELL, P.E.
Northridge, Calif.

Most gratifying, (the) expanded Readers' Service Department.

RICHARD J. GRAY, P.E.
Barberton, Ohio

I like the new Readers' Service Card!

RUSSELL L. PARKER, P.E.
Waverly, Ohio

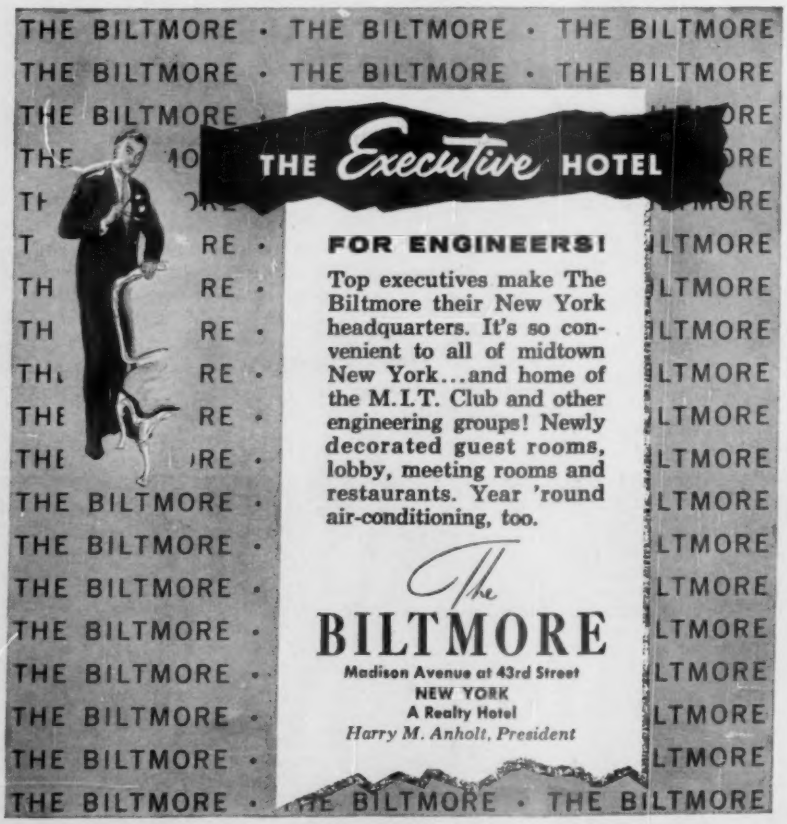
The new format of AE is a welcome change. The compartmentalized topics will save significant time.

My personal reaction to the new cover is negative. The magazine has lost its distinctiveness and now looks like one of the dozens of trade journals. I liked the previous cover.

CHARLES C. TOMLINSON, P.E.
Baltimore, Md.

Congratulations on the "new look" to the AMERICAN ENGINEER! It's terrific! . . . I particularly like the new interior format, more readable, more interesting, and easier to find articles, as well as being more attractive. I like the new AE sig, too. I like all of it! And you all are certainly to be congratulated.

Miss GLORIA ALLEN
Public Relations Director
Texas SPE
Austin, Tex.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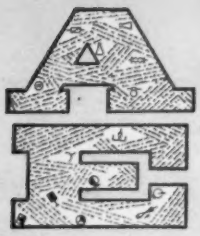

"This Month"

When one is reminded that in 1959 more than $7-billion will be spent at all levels for highways, one sees in some measure the multitude of problems that face road building of which the asphalt industry is such an integral part. And at the hub of that industry's "wheel" is their research and educational institution, The Asphalt Institute. "This Month" AE completes a staff report on the Institute in the piece, "Three-Fold Program Increases to Meet Industry's Challenge." Begins on page 17.

You don't really have to be an egg-head to enjoy good literature, especially if that literature is about engineering. Literature and engineering? Yes, that's right. You may not know it but many engineers, beginning with Agricola himself, have taken pen in hand over the ages and it was good material that was turned out, too. You'll enjoy "The Classics of Engineering Literature" that starts on page 23. It's written by a man who has seriously studied engineers and their literary efforts, New York University English Professor, Walter James Miller. (You'll find the woodcuts fascinating, as well!)

This month's "Engineer At Work" piece directs attention to a wonderful new dam going up on the Zambezi River located between Northern and Southern Rhodesia in Africa. Here, as in other quarters of the globe, engineers are giving "an underdeveloped area a future." An interesting engineering report on a major project. Page 28.

A look at the month's news:

Consulting. The NSPE Functional Section for Consulting Engineers, with approval of the Board of Directors, has advanced $2,000 toward 1959 operations of the American Thrift Assembly. (The ATA wishes legislation that would amend tax laws so self-employed persons may deduct a portion of their income for building a retirement fund.) Another Consulting Development: The NSPE-approved Professional Engineers Liability Insurance policy has had significant changes. Full story, page 8.

Education. Here are the headlines: American Professors Visit USSR Engineering Schools, and Carnegie Tech Announces Westinghouse Scholarship Program. Both good stories.

Government. Don't miss the lead story here "Civil Service Commission to Release Salary Study," for engineer starting pay may be revised. Other news: A look at highway engineers' salaries and a report on NSPE's Functional Section for Engineers in Government Practice.

Industry. The news spotlight on court decisions enjoining engineers from disclosing confidential information and trade secrets of former employees. A full and complete story. Also: Story and chart comparing engineers' salaries over the years with industrial wage earners.

And, in the back of the book, a story vital to all really interested in engineering professionalism: "Dues Increase Necessary to Finance Society Activities." See page 31.

Kenneth E. Trombley

Editor

Strictly Business

Personalities . . . The appointment of **Paul J. Louzecky** as chief engineer, Engine Division, **Nordberg Manufacturing Company**, Milwaukee, Wis., has been announced by **Robert E. Friend**, president . . . **Benedict & Associates, Inc.**, Detroit, Mich., have announced the appointment of **Louis J. Kormendy** as chief electrical engineer . . . **Richard M. Bush** has been named senior consultant on the Washington, D.C., staff of **Ebasco Services Incorporated** . . . **Samuel W. Chantler** has been appointed director of research and development for **The Allen Manufacturing Company**, Bloomfield, Conn. . . . **Wiser Brown**, chief industrial engineer for **Aluminum Company of America**, has retired after thirty-six years of service with **Alcoa** . . . **Arthur C. Westrom** has been appointed director of engineering, research and development of **Hubbard and Company**, Chicago, Ill. . . . **Robert F. McCune** has announced his resignation as vice president of the **Place Ville Marie Corporation**, a **Webb & Knapp** (Canada) Ltd., venture, to become president of **Canadian American Associates Ltd.**, with main offices in Montreal . . . **John Q. A. Greene** has retired from all executive duties of **Gunite and Construction Company**, but will serve as West Coast representative for the firm with offices in Los Angeles, Calif.

Mr. Louzecky

The creation of a new executive post and two engineering promotions have been announced at **Tamar Electronics, Inc.**, Los Angeles, Calif. **John S. Overholser**, formerly chief engineer, was named director of engineering research; **Kenneth E. Wilcox** was appointed chief engineer, and **Rex C. Bean** was promoted to assistant chief engineer . . . **Norman D. Baumgart** has been assigned as soils-cement engineer of the five-state Rocky Mountain Region of the **Portland Cement Association. PCA** also announced the appointment of **Hugh D. Barnes** to the new position of supervisor of field promotion . . . **George Gumas** has been appointed vice president in charge of engineering at **CDC Control Services, Inc.**, Hatboro, Pa. . . . **Roland Whitehurst** recently retired as a vice president of **The Electric Storage Battery Company** after more than fifty years' service . . . **Melville W. Robinson** has been named chief engineer for **Callery Chemical Company**, Pittsburgh, Pa. . . . **George Stern** has joined the **Nuclear Development Corporation of America**, White Plains, N.Y., as manager of the Materials Department . . . The appointment of **Woodrow L. Burgess** to the position of assistant director of engineering for **The Master Building Company**, Cleveland, Ohio, has been announced.

Mr. Baumgart

Searle G. Nevius has been named senior electronics engineer of the **Leach Corporation**, Compton, Calif. . . . **Lawrence P. Hallahan** has been appointed to the newly-created position of plant engineer for the Jeffersonville, Ind., plant of the Phosphorus Division of **Hooker Chemical Corporation** . . . The appointment of **Alexander M. Beebee, Jr.**, as plant engineer of the Rochester, N.Y., Products Division of **General Motors Corporation** has been announced . . . **J. Gilbert Mohr** has joined **L.O.F. Glass Fibers Company** as an engineer in the Product Planning Department . . . **Ketchum and Konkel**, Consulting Engineers, Denver, Colo., have announced the advancement of three firm members to the position of project engineer. They are **Ole F. Melleby, Eugene N. Catalano**, and **Earl F. Sorensen** . . . The appointment of **C. W. Massie** as general manager of the Construction Machinery Division of **Clark Equipment International, C. A.**, has been announced by **W. E. Schirmer**, president . . . **William M. Harmon** has been appointed chief engineer for the **United Sheet Metal Company**, Columbus, Ohio . . . Two promotions and a new appointment in the engineering department of **The Barden Corporation** have been announced. **Lewis W. McKee** has been made chief product engineer; **John J. Murphy** has been promoted to contract research manager, and **Kenneth D. Mackenzie** has joined the firm as advanced product manager . . . **James C. Richards, Jr.**, has been named vice president-sales of **B. F. Goodrich Industrial Products Company**, Akron, Ohio.

Mr. Beebee

New Firms . . . **H. F. Zimmerman** announces the formation of the consulting engineering firm of **Zimmerman, Evans and Leopold** with offices in Atlanta and Augusta, Ga. . . . **Ralph Pierce** and **Anthony J. Wolf** have organized an engineering firm to be known as **Pierce and Wolf**, Consulting Engineers, Detroit, Mich. . . . The firm of **Driver and Spooner**, Consulting Engineers, Coral Gables, Fla., has recently opened . . . **Robert H. Hendron** announces the opening of consulting engineering offices in Helena, Mont.

New Branch . . . **Col. H. C. Gee**, president of **Gee and Jenson**, Consulting Engineers Inc., announces the opening of a new branch office in Dunedin, Fla.

Texas Engineers Win Awards In Bridge Design Competition

Farland C. Bundy and Charles S. Matlock, engineers with the Bridge Division, Texas Highway Department, Austin, Tex., received the $10,000 first award in the $50,000 bridge design competition for welded bridges for interstate and defense highways, sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. Bundy and Matlock shared the award for the design of the recently completed Buffalo Bayou Bridge in Houston, Tex., a 668-foot all-welded continuous plate girder bridge. Designs were judged on the basis of economical use of labor and steel, appearance, cost, general quality of detail and other advantages of welded construction. The bridge has also received recognition in a competition for the most beautiful steel bridges erected in 1957, sponsored by the American Institute of Steel Construction.

A team of turnpike engineers in Dallas split $7,500. They were Joe C. Bridgefarmer, Douglas A. Nettleton, and William Llewellyn Powell. The second award was for the design of an all-welded arch bridge on the Dallas-Fort Worth Turnpike. The 192-foot span of four welded box girder arch ribs is claimed to be the first bridge of this type in the United States.

Ease of welded fabrication for this latter structure permitted completion of fabrication and erection in three months and four days.

The five engineers are members of the Texas SPE.

Significant Decision By Utah Supreme Court

In a significant decision, the Utah Supreme Court has upheld the constitutionality of the State's engineering registration law. The Court also cited the applicant's lack of professional society membership and his failure to make creative contributions to any engineering committee or society as pertinent factors in denying him registration by eminence. Watch next month's AMERICAN ENGINEER for complete details.

Salaries Increased in 1958, Survey Shows

A starting salary survey of eleven engineering schools, conducted by the editors of *Machine Design*, finds an increase of five per cent for 1958, compared to a yearly increase of ten per cent in both 1956 and 1957. Averages were reported in the range of $475 to $515. Again in 1958, electrical engineers were at the top—from $480 to $535.

Winners and Their Bridges

Reading from top to bottom: Farland Bundy (left) and Charles Matlock were named co-recipients of the $10,000 first award in a competition for welded bridges. Second award winners are shown, l.-r.: Douglas A. Nettleton, William L. Powell, and Joe C. Bridgefarmer. Below them are the girder bridges which won the $10,000 top award, and at the bottom is the bridge which won the second award. The winners are members of the Texas State Society.

Contribution to American Thrift Assembly Approved

A $2,000 partial advance contribution for 1959 operations of the American Thrift Assembly was approved by the Executive Committee of the Functional Section for Consulting Engineers in Private Practice and the NSPE Board of Directors at the San Francisco meeting. The American Thrift Assembly is the coordinating organization of professional societies and other groups with self-employed membership backing the Jenkins-Keogh legislation to amend the tax law so self-employed persons may deduct a portion of their income (not exceeding ten per cent or $2,500 per year) for building a retirement fund. The amount deducted would not be subject to income tax but the income tax would be paid on the withdrawals from the retirement fund starting at the age of sixty-five.

Robert C. Vogt, NSPE Representative to the American Thrift Assembly, and a member of the organization's Executive Committee and Board of Directors, reported to the NSPE Board on progress in seeking enactment of the legislation. It passed the House of Representatives in the 85th Congress by an overwhelming vote, but did not reach a vote on the merits in the Senate. Vogt said the ATA is optimistic for its chances in the 86th Congress which starts in January.

The appropriation was from funds contributed by consulting engineers, and Vogt said it is expected that additional supporting funds will be provided through further contributions of consultants later this year. Last year NSPE contributed a total of $3,500 to ATA and it is expected that this sum will be matched for 1959 operations. Other supporters include the American Medical Association, American Bar Association, American Institute of Architects, American Institute of Certified Public Accountants and the American Dental Association. Altogether approximately ninety national organizations support the ATA fight for the retirement legislation.

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(Circle 1 in Readers' Service Dept.)

Liability Insurance Policy is Improved

Changes in the NSPE-approved Professional Engineers Liability Insurance were reported by Task Force No. 4 of the Functional Section during the fall meeting of the National Society. Chairman Arlow V. Ferry of the task force advised the Functional Section Executive Committee that the insurance writers had agreed to a number of significant changes which will improve and clarify the policies.

In addition to reduction in premiums, which were announced at the June meeting, the task force listed the following major improvements: date of issue of original policy will appear on the declaration page; the reference to "negligent" has been deleted, and the reference now will be to "error, omission or act;" coverage in the case of corporations applies to executive officers, directors and stockholders. There were a number of other technical changes listed by the task force.

The insurers have agreed to reduce the minimum premium to $100 subject to the three-year term rules, and negotiations are underway which, it is hoped, will enable the insurers to increase the limit of protection to one million dollars.

Consulting engineers desiring detailed information on the liability insurance may contact their local insurance agent or Victor O. Schinnerer and Company, Inc., Investment Building, Washington, D. C. Other members of the Functional Section task force are S. J. Callahan and H. R. Veenstra.

Surveying Services Ruled As 'Labor Performed'

A consulting engineering firm which performed surveying services at the construction site of a state highway project was held to be included within the term "labor performed" as contained in the state statute requiring contractors' bonds on all public works. This interpretation, reached by the Miami County, Ohio, Common Pleas Court, permitted the engineer to collect from a bonding company sums due from a general contractor under the contractors bond obligation to pay "all lawful claims of subcontractors, material

AE Meetings of Note

American Society of Mechanical Engineers—Annual Meeting, November 30-December 5, Hotel Statler and Hotel Sheraton-McAlpin, New York, New York.

American Society of Refrigerating Engineers — Semi-Annual Meeting, December 1-3, Hotel Roosevelt, New Orleans, Louisiana.

American Rocket Society—Annual Meeting, December 1-5, Hotel Statler, New York, New York.

American Institute of Chemical Engineers—Annual Meeting, December 7-10, Netherland Plaza Hotel, Cincinnati, Ohio.

American Nuclear Society—Winter Meeting, December 8-10, Sheraton-Cadillac Hotel, Detroit, Michigan.

American Society of Agricultural Engineers—Winter Meeting, December 17-19, Palmer House Hotel, Chicago, Illinois.

American Association for the Advancement of Science—Annual Meeting, December 26-31, Sheraton-Park Hotel, Washington, D.C.

men and laborers for labor performed and materials furnished." A "friend of the court" brief was filed in this case by the Ohio Society of Professional Engineers which contended that the general contractor's bond obligated it to pay the engineer's claim because the engineer's services were "labor performed," and further that he and his employees were "laborers" under the terms of the bond.

The facts leading to the dispute were briefly these: A general contractor, awarded a contract for improvement of certain sections of a State highway, entered into an agreement with the engineering firm under the terms of which the firm was to furnish all necessary surveying work for the project other than was furnished by the State Highway Department. For these services the engineering firm was to receive a specified per diem rate for a surveying crew, plus a separate rate for consultation or necessary engineering work performed in the engineer's office. In compliance with Ohio statutes, the general contractor furnished a bond requiring payment for all "labor performed," and materials furnished by subcontractors, material men and laborers. When the general contractor defaulted on the balance due the engineering firm, legal action was instituted.

The specific question to be decided by the court was whether or not surveying services constituted "labor" as that term is used in the Ohio statute providing for general contractors' bonds.

In its opinion, the court noted an analogy between the contractors' bond statutes and the mechanics' lien statutes such that it was apparent that the state legislature intended to make the sureties upon contractors' bonds liable for such labor and materials furnished for public works or improvements as would be the subject of a mechanic's lien if the property were privately owned. A mechanic's lien is a claim created by law for the purpose of securing priority of payment of the price or value of work performed in erecting or repairing a building or other structure. Court decisions in Ohio under the mechanics' lien statute, involving claims by architects for services rendered, generally have held that an architect is entitled to a lien for supervising construction, but that he is not entitled to a lien for drawing plans and specifications. Thus, in cases under the mechanics' lien statute involving architects, the court has drawn a distinction between services which constitute "work" performed on the structure within the mechanics' lien statute, such as construction supervision, and work not performed on the premises.

Accordingly, the court noted that an examination of prior Ohio cases reveals no basis for excluding a laborer from the benefits of either the mechanics' lien or contractors' bond statutes "merely because he is a skilled worker or renders professional services, such as an architect or engineer." The only requirement is that the services rendered must actually be performed at the construction site.

In this case most of the work of the engineering firm was performed at the site of the highway improvement, and only a small amount was done at the office. Consequently, the court concluded that the engineer could recover under the contractor's bond for surveying services actually performed at the construction site, since the contract was divisible in that it provided for separate fees or "on-site" and "off-site" services.

Revised Fee Report Nears Completion

Task Force No. 2 of the Functional Section presented the draft of a completely revised report on "Summary of Manuals of Practice and Fee Schedules for Consulting and Design Engineering," at NSPE's fall meeting. The new draft proposes to revise the text of the August, 1956, compilation and comparison report to bring it up to date and include more material on definitions and recommendations on some items.

Chairman Frank Sanford of the task force advised the Functional Section Executive Committee that the final report will make the summary of observations more general and omit the considerable amount of detail reference to individual state manuals. The Functional Section hopes to have the completed report ready for publication and distribution very shortly. As soon as it is available, notice will be carried in the AMERICAN ENGINEER.

Firm Sign Available

The above sign, printed by the silk-screen process in attractive colors, has been made available to members of the Washington SPE for use on engineering project sites. It measures 2' in length and is 14" high and is constructed of sturdy hard board material. The cost is $3 each with a minimum of 12 signs. NSPE members may obtain full details by writing: Washington SPE, 512 1st Avenue North, Seattle 9, Wash.

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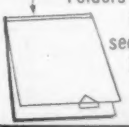

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American Professors Visit USSR Engineering Schools

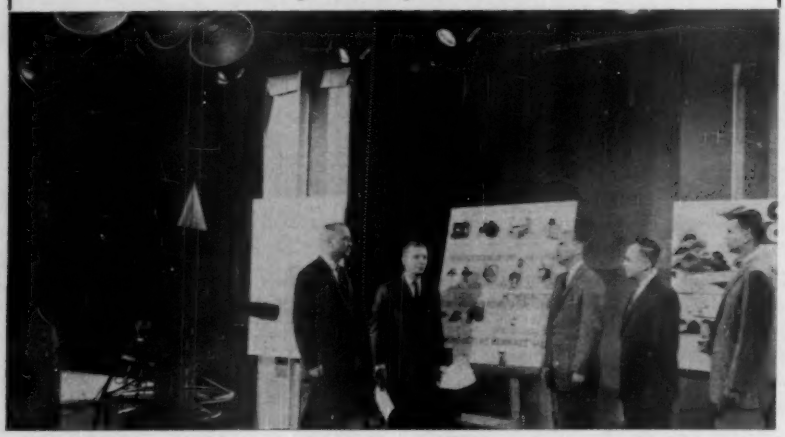
Eight American engineering professors visited Russia in November to make the first official post-war inspection of the USSR's fast-growing facilities for training scientists and engineers.

In three weeks in the Soviet Union, members of the Exchange Mission on Engineering Education visited schools and officials in Kharkov, Stalinsk, Tomsk, Novosibirsk, Frunze, and Moscow. They hope to return early in December with a new evaluation of Russia's engineering schools—and new viewpoints which may help American colleges and universities meet the USSR's challenge.

A grant of $29,000 from the National Science Foundation made the mission possible, which is a project of the American Society for Engineering Education, cooperating with the East-West Contacts Staff of the Department of State.

Dr. Frederick C. Lindvall, chairman of the Division of Engineering at the California Institute of Technology, is chairman of the ASEE exchange mission, and Professor Newman A. Hall, head of the Department of Mechanical Engineering at Yale University, is secretary. Other members are: William T. Alexander, dean of engineering at Northeastern University, Boston, and president of the ASEE; Dr. William L. Everitt, dean of engineering at the University of Illinois and president of ECPD; Professor Ralph E. Fadum, head of the Department of Civil Engineering at North Carolina State College; Dr. Albert G. Guy, professor of metallurgical engineering at Purdue University; Dr. Ralph A. Morgen, director of the Purdue Research Foundation, and Dr. Leon Trilling, associate professor of aeronautical engineering at the Masachusetts Institute of Technology.

Engineering Careers



Engineering careers in the Milwaukee area are receiving a big boost through the joint cooperation of television, industry and education. A new 13-week program has been initiated over Station WISN-TV with the cooperation of the Milwaukee School of Engineering and Milwaukee area firms. Here, Controls Company of America shows career opportunities for young men. Shown are, l.-r.: Phil Starbuck, vice president and director of Industrial Relations at Controls Company; Lee Murry of WISN-TV, and program participants E. E. Burmeister, Harry Weigert and Robert Bauer, all of Controls Company.

Carnegie Tech Announces Westinghouse Program

President John C. Warner of Carnegie Institute of Technology has announced the opening of the 1959 competition for George Westinghouse Scholarships at Carnegie Tech. Ten four-year scholarships valued at $4,250 apiece will be awarded to secondary school seniors next spring for study in the fields of engineering, science, and management.

The Westinghouse program is observing its twentieth anniversary. It was inaugurated in the fall of 1938, sponsored by Westinghouse Electric Corporation through its Educational Foundation. This was one of the first scholarship plans for encouraging talented young people throughout the United States to seek careers in technological fields.

Westinghouse Scholars are carefully selected from over 1,000 applicants each year. The program's graduates through 1958, with an average age of only thirty-two years, have recorded a remarkable series of achievements in graduate study (eighty per cent have attended), teaching, and employment in industry and government.

Announcement of the scholarship competition has been made in an information packet mailed to 15,000 secondary school science teachers across the nation, and in a brochure sent to 27,000 principals and school administrators. Students of all secondary schools (public, private, or parochial), were eligible to apply, with the deadline for applications set at December 1.

In other news from Carnegie Institute of Technology, the school has announced a gift of $2,800,000 from Mr. and Mrs. Roy A. Hunt, for the construction of a new campus library. The Hunt Library, an impressive structure of steel framing with aluminum facing, is designed to accommodate 350,000 books in the library proper, plus another 125,000 in basement alcoves. A sub-basement is also provided for storage and file space.

The architects for the library are Lawrie and Green, Harrisburg, Pa.

Civil Service Commission To Release Salary Study

- Engineer Starting Pay May be Revised
- Table Below Shows Present Levels

Publication is expected soon of a comprehensive study by the Civil Service Commission to determine whether to readjust the salaries of Federally-employed engineers and scientists. Under existing law, the Commission can raise the starting rate of pay for certain classes of employees, expressed in dollars per year, to a level not exceeding the highest rate provided in law which is believed necessary to recruit the type and number of qualified employees required. This was done by the CSC in December, 1957, when the starting salaries for engineer and scientist positions were raised to the top step of the respective grades.

Since the recent ten per cent general classified pay increase became law, starting rates for engineering and scientific personnel no longer equal the maximum step for each grade. Rather, the beginning rate for engineers and scientists appointed or promoted to certain grades lies somewhere between the minimum and maximum salary levels for each grade on the General Schedule (usually at in-grade step 3 or 4). The purpose of the new study is to find out if conditions require the Commission to once again raise engineers and scientists starting salaries to the maximum allowable for each grade.

How did the present situation come about? Why will engineers and scientists for the present at least, no longer be paid the maximum rate upon promotion or appointment to a higher grade as they were prior to the recent ten per cent increase?

In order to fully comprehend the Commission's present position regarding engineer-scientist starting pay, it is essential to clarify one basic proposition which is generally unknown or often misunderstood. Essentially the principle is this: When the Commission raises starting pay for certain classes of employees at higher than the regular minimum for each grade, it does so in terms of dollars per year, rather than at any specific step in the various grades. For instance, when starting rates were raised in 1957, the Commission in effect was not saying "hereafter and forever engineers will be hired at the top step of the respective grades." Instead, the Commission determined that "an adequate number of qualified engineers can be hired at this number of dollars." The recent ten per cent increase had no substantial effect on these previously established starting rates expressed in dollars per year, which only incidentally were equal to the maximum rate for each grade. They remained the same except for a technical adjustment to the next highest level in the new schedule. In essence the Commission's present position is that established starting rates, in dollars, for each of the grades, are still sufficient to recruit the required number of engineers and scientists.

In order to present the adjusted starting rates, plus the percentage and dollar increase which can be expected upon promotion, a reference table has been prepared. Using the GS-9 line as an example, it can be seen in column II that before the recent increase all GS-9 engineers and scientists were earning $6,250 per year (top of the grade). This was increased to $6,885 as indicated in column III when all other classified employees were granted a ten per cent increase. Upon promotion to GS-11, these engineers will begin at $7,510 per year (third step), a $625 or 9.1 per cent increase over their present salary. Prior to the 1958 increase, the starting rate for GS-11 engineers was a comparable $7,465 a year.

Reference Table

I Grade	II Top Step of Grade Before Increase of June, 1958	III Top Step of Grade After Increase of June, 1958	IV On Promotion to Next Grade, Salary Will Be:	V On Promotion to Next Grade, Increase Will Be:	VI Percentage Increase Over Present Salary
GS- 5	$ 4,480	$ 4,940	$ 5,430 (GS- 7)	$ 490	9.9%
7	5,335	5,880	6,285 (GS- 9)	405	6.9
9	6,250	6,885	7,510 (GS-11)	625	9.1
11	7,465	8,230	8,810 (GS-12)	580	7.1
12	8,645	9,530	10,130 (GS-13)	600	6.3
13	10,065	11,090	11,595 (GS-14)	505	4.6
14	11,395	12,555	12,770 (GS-15)	215	1.7
15	12,690	13,970	14,190 (GS-16)	220	1.6
16	13,760	15,150	15,375 (GS-17)	225	1.5
17	14,835	16,335	17,500 (GS-18)	1,165	7.1

NOTE: Starting salaries of new employees will be those indicated in Column IV for the respective grades shown in parentheses.

State Highway Salaries Rise in Recent Years

Salaries of state highway engineers have risen an average of sixteen per cent in the last two years, the American Road Builders' Association reports. At the same time, ARBA said, salaries in most states are still lagging behind the minimums recommended by the American Association of State Highway Officials.

The ARBA's fifth survey of state

highway engineers' salaries is a comprehensive study of salary ranges for all grades of state highway engineers throughout the United States. As of the past summer, the averages included the following: chief engineer, $11,687-$14,045; bridge engineer, $9,370-$11,287; design engineer, $9,190-$11,121; district engineer, $8,832-$10,686. The report covers twenty-one job categories for each state. The full report is available from ARBA, World Center Bldg., Washington 6, D. C.

Govt. Functional Section Represents Challenge

"Formation of Functional Sections for Engineers in Government Practice by the state societies represents a challenge and an opportunity to develop active programs directed toward the pin-pointed needs of engineers engaged in city, county, state or Federal employment," Leonard N. White, chairman of the NSPE Functional Section for Engineers in Government Practice, said recently.

"Such crucial problems as professional qualifications, registration and salaries can be studied and analyzed. Plans of action can be developed for adoption and support by the parent society. The conduct of these activities within the over-all framework of the professional engineers' organization will undoubtedly attract attention of nonmembers and can serve as a membership promotion measure," he added.

Establishment of a Functional Section for Engineers in Government Practice in a state society can be assisted through the Executive Committee which is listed below, Mr. White said.

Chairman—Leonard N. White, 449 State Capitol Bldg., Little Rock, Ark.

Secretary — R. Emmit Welsh, 3027 Highland Ave., Kansas City, Mo.

Vice Chairman—N. E. Area—Wesley E. Gilbertson, Room 4006, South Bldg., Health, Education & Welfare, Washington 25, D. C.

Vice Chairman—S. E. Area—Ernest M. Titus, 402 Union Bldg., TVA, Knoxville, Tenn.

U.S. Civil Service Commission

The headquarters building of the United States Civil Service Commission in Washington, D.C., is the site for many important decisions which greatly affect the engineer in government.

Vice Chairman—Central Area—Melvin E. Amstutz, Lake County Hwy. Dept., Winchester R., Libertyville, Ill.

Vice Chairman—N. Central Area—Gordon E. Bodien, 203 City Hall, Minneapolis 15, Minn.

Vice Chairman—S. W. Area—George R. Hawthorne, 203 Camino De Note, Santa Fe, N. Mex.

Vice Chairman—Western Area—E. L. Mathes, Bureau of Highways, Boise, Idaho.

CAA Needs Electronics Engineers in Alaska

The Civil Aeronautics Administration is recruiting electronic engineers for duty in Alaska, "where hunting and fishing are nearly perfect," and where, incidentally, a twenty-five per cent cost of living allowance is added.

College graduates hired at Grade 7 by the Federal Government will have to wait at least a year before promotion to Grade 9. Only "quality" graduates in engineering, science and a few other professions will be hired at Grade 7 for the time being.

ECPS to Recruit for Federal Agencies

The Engineering Societies Personnel Service has been designated by the U. S. Civil Service Commission to recruit engineers and scientists. Federal policy permits the use of non-profit professional employment services to secure applicants for Federal employment in hard-to-fill engineering and scientific positions.

Controversy Arises Over Revealing Trade Secrets

- Recent Court Decisions Are Analyzed
- Two Cases Cited Involving Engineers

To what extent may an engineer utilize knowledge, skill and information acquired during a period of employment for the benefit and advantage of himself or subsequent employers? What are the limitations on the dissemination of such knowledge gained from practical experience while previously employed? These and similar questions have recently been spotlighted and a furor raised as the result of several alarming reports of court decisions enjoining engineers from disclosing confidential information and trade secrets of former employers, in which reports it was boldly asserted that as a consequence, engineers may not be the sole and exclusive possessors of their own knowledge and skill. A closer examination and analysis of the major court decision upon which these stories were based, *Monsanto Chemical v. Miller*, plus detailed scrutiny of a more recent related decision in California, suggests such alarming conclusions are unwarranted.

A trade secret is any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It must consist of a particular form of construction of a device, a formula, method or process that is of a character which does not occur to persons in the trade with knowledge of the state of the art or which cannot be evolved by those skilled in the art from the theoretical description of the process, or compilation or compendia of information or knowledge.

In reality, the implications of the much-heralded *Monsanto* case are not as broad and far-reaching as was first intimated. That case involved a claim by Monsanto Chemical Company that the defendant, Charles M. Miller, formerly employed by it, revealed certain trade secrets having to do with the design and operation of electric furnaces for the production of elemental phosphorus. Miller was employed by Monsanto in 1942, and continued so until 1954 with the exception of one intervening break during the war. In 1956 he was employed as a consultant by Central Farmers Fertilizer Company, and in this capacity worked closely with the F. C. Torkelson Company which was engaged by Central Farmers as the engineering firm to make preliminary design and cost reports in connection with the construction of a phosphorus plant. Monsanto claimed that Miller, by unauthorized disclosure of its trade secrets, had permitted them to find their way into the discussion, planning, evaluating and design of the Central Farmers plant, and further that Miller actually carried away from Monsanto over 100 physical drawings which, with related matters, were applied in the design of the furnace for Central Farmers.

The court found as a fact that Monsanto pursued a "broad policy of not considerately or deliberately releasing to the public the designs of its electric furnaces and their refinements nor its cost data." Accordingly it was determined that the information and blueprints appropriated by Miller actually constituted legitimate, protected trade secrets of Monsanto, the disclosure of which constituted a breach of confidence on the part of Miller.

Further, the court declared that Miller had a common law duty not to reveal engineering data, design, or other information confided to him while in the employ of Monsanto and which comprised trade secrets of Monsanto. Although finding Miller to be impliedly bound by a signed agreement under which he was obligated to preserve the confidence of his employer, the court went on to conclude, however, that "there is no real substantial difference in the matters determinative here between Miller's common law obligation and his contractual obligation."

In its final decree, the court permanently and perpetually enjoined and restrained Miller from disclosing, further appropriating, or otherwise using any of Monsanto's trade secrets, and in addition ordered Miller to return to Monsanto all of the drawings, blueprints, cost data and other records and reports which he had taken. In essence, nothing more can be read into this decision other than that a Federal court has permanently enjoined a former employee from unlawfully appropriating and disclosing a legally protected property right, *i.e.*, trade secrets.

A more recently-decided, and related case, in which an opposite conclusion was reached, is *Sarkes Tarzian, Inc. v. Audio Devices, Inc.* There, Tarzian, Inc. sought an injunction and damages against Audio and eight employees of Audio formerly employed by Tarzian in key engineering and production positions. The complaint alleged that Tarzian had developed confidential, restricted and secret data, production knowhow and information concerning the manufacture of silicon rectifiers, and that the individual defendants, with knowledge of such information, had conspired with Audio with the object of depriving Tarzian of its trade secrets. Extensively reviewing all authorities on the subject of trade secrets, the court found that the information which

the defendants may have disclosed to Audio was generally known in the trade, and did not therefore constitute trade secrets. It was further held that the eight employees left Tarzian for legitimate reasons and not as the result of a conspiracy between them and Audio. Unlike the factual situation in the *Monsanto* case, there was no evidence that any of the employees took with them any blueprints, written data or invoices.

In the course of its comprehensive, lengthy decision, the court made several decisive and enlightening statements bearing on the entire question of employee knowledge vs. protected trade secrets. Several excerpts follow:

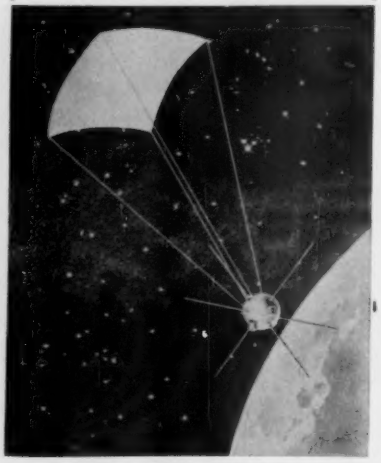
"Ordinarily, whether the courts consider the wrongful acquisition of trade secrets a violation of a property right or not, in the last analysis, the essence of it is a violation of trust." * * * "It is this breach of duty which the court protects, regardless of any specific contract undertaking the obligation of secrecy. But in applying the concept the law bears in mind the fact that prior employment of a person *does not* impose upon the employee, in the absence of a contract limited as to time and location, the duty not to compete with his former employer." * * * "Of necessity, whenever a change of employment of this type occurs and former employees enter into the employ of another with whom they engage in a competitive business, it is inevitable that some of the knowledge acquired while in the employ of the other should be made available to the new employer. But, as already appears, the courts will not deprive the employee of the right to use his skill he has developed through the years." * * * "So there is agreement among the courts that, except where real trade secrets are involved, an employee may compete with his former employer and use such knowledge and skill as he has developed in the former's employ." * * * "Whether a method is or is not unorthodox does not determine its validity as a secret. It is whether it is unique and unknown in the trade that is important, or whether there is discovery in selecting between alternative steps."

Conclusion

The issues in these two cases are not particularly complex or involved. The law on trade secrets is generally well settled; questions arise in applying that law to the facts in varying situations and under varying conditions. It seems patently clear from the decisions, and especially from several of the above-quoted excerpts from the Tarzian decision that if legitimate trade secrets are found to exist, injunctive relief will be granted to prevent their unauthorized disclosure. There is no indication, nor can it be inferred, that an employee is being deprived of the general use of his acquired knowledge and skill when he is prevented from utilizing to his own advantage or the advantage of his subsequent employer information, know-how or processes which another takes reasonable care and diligence to retain as trade secrets, and which in fact are found to be trade secrets.

With the exception of acknowledged trade secrets and confidential information, knowledge, skill and information become a part of the employee's personal equipment. They belong to him as an individual for the transaction of any business in which he may engage, just the same as any part of the skill, knowledge, information or education that was received by him before entering the employment. These things cannot be taken from him; therefore, on terminating his employment he has a right to take them with him. This right does not appear to be abridged by the court's decision in the *Monsanto Chemical* case.

Sails for Space



Aluminized plastic sails like the one shown in this artist's conception have been suggested by a General Electric engineer as a possible answer to the problem of powering future space vehicles. Norman F. Barnes of the Company's General Engineering Laboratory at Schenectady, N.Y., said the sails, using energy from the sun, could boost the speed of a space ship by about 350 miles an hour each day. He sees no application on today's earth-to-moon rockets, but believes it has promise for much longer voyages to other planets.

Pending Case Vital to 'Sounding Board' Groups

The Supreme Court has agreed to review the decision of the U.S. Court of Appeals for the Fifth Circuit, holding that an employee-management committee that avoids collective bargaining and had no bargaining power is not a "labor organization" (union). The forthcoming Supreme Court decision will be vital to engineering "sounding board" groups (*Cabot Carbon v. NLRB*).

Elsewhere, a New York court turned down the bid of the engineers' union at Sperry Gyroscope to force arbitration of an issue raised by an employee who was denied a promotion. The employee claimed he was entitled to promotion because he was performing work in a higher classification, but the court found that the contract with the union gave the employer the sole right to determine promotions (*Matter of Hall*, N.Y. Supreme Court, N.Y. County, Special Term, Part I, CCH 71,887).

After almost a year of formal hearings before the New York office of the National Labor Relations Board, the end is almost in sight in the case between the Council of Western Electric Professional Employees—National (ESA) and the Western Electric Company over collective bargaining representation of engineering and related employees.

The union had been certified to represent professional-technical em-

ployees in 1952, but it has been without a contract for the past three years. The main issue in dispute is the professional qualification of some of the employees in the unit. The union says it wants to represent only professionals, but the parties disagree on the appropriate classification for various categories.

Following the lengthy presentation of the union's witnesses, the company agreed to accept the union testimony as substantially descriptive of each category in dispute, as the basis for the NLRB to decide professional status. The union accepted the stipulation after failing in an effort to include the equipment engineers whose status will require additional testimony. The agreement provides a basis for resolving the status of 409 of the 508 employees whose professional status is in dispute. The hearings resumed in November, and it now appears that the new election may take place early next year.

Supreme Court Hears Taft-Hartley Case

The Supreme Court has heard oral arguments in a case of vital importance to the engineering profession. All parties, including NSPE as a "friend to the Court," had previously filed written briefs. In this case, *Leedom v. Kyne*, the issue is whether the National Labor Relations Board may be enjoined from including some nonprofessional employees in a voting unit on collective bargaining representation desires. The NLRB contends that despite the clear language of the law prohibiting the inclusion of nonprofessionals the courts may not prevent the Board from taking such action. The NSPE brief insists that the courts have jurisdiction to prevent an open violation of the statute by the Board.

Both the Federal District Court and the Court of Appeals have sustained the view favored by the Society. A full report on the decision will be carried in a future issue of the AMERICAN ENGINEER and in NSPE's "Engineering Employment Practices Newsletter."

Salary Levels Compared

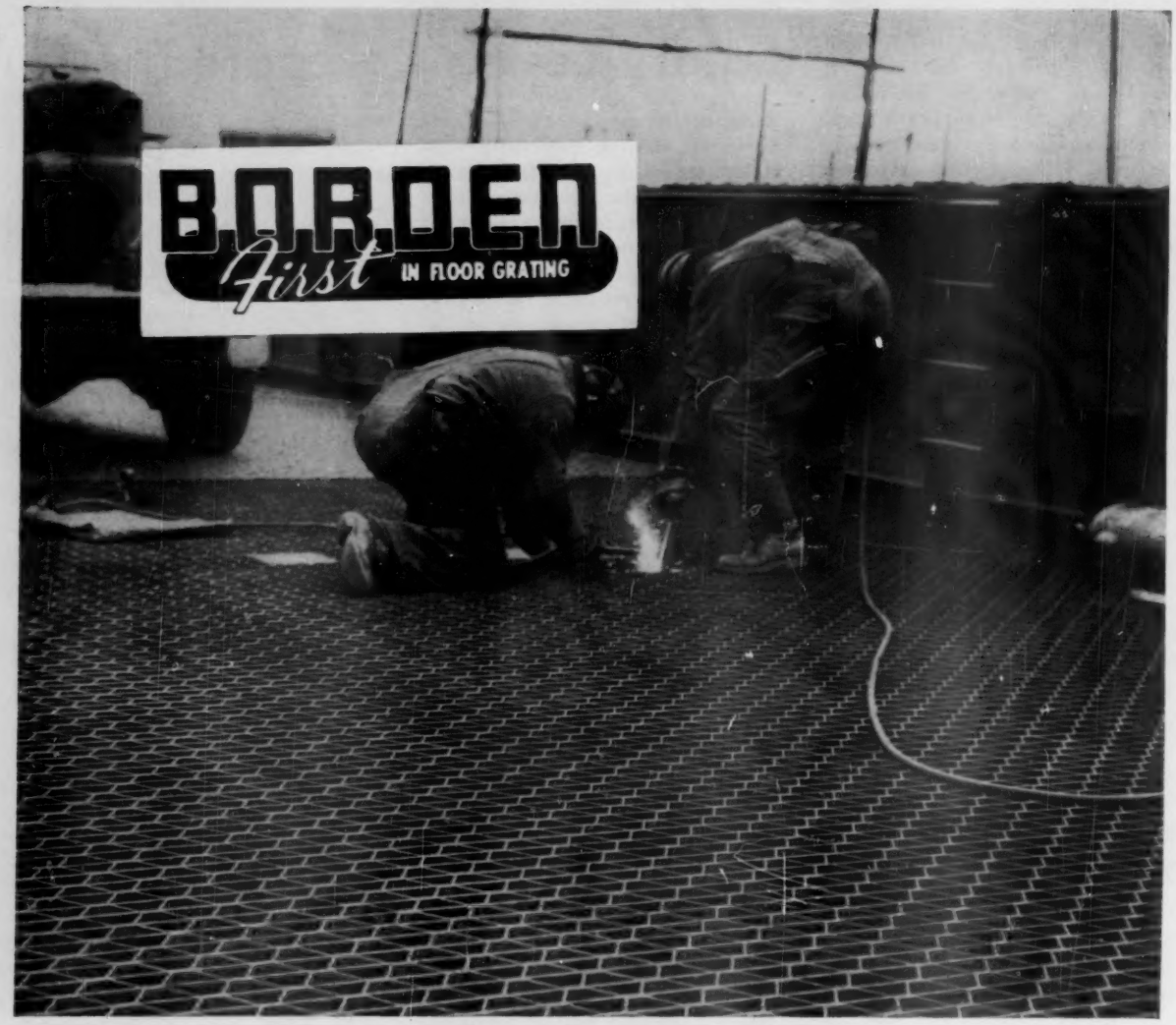
Because of the continuing interest in the subject, the NSPE Subcommittee on Engineers-in-Industry has compiled the table below dealing with statistical information on engineers' salaries and the wages of industrial workers. Generally such information is required for the purpose of making a comparison between the two salary levels, and for determining relationships over a period of years.

In instances, the Subcommittee points out, it has been indicated that information about the cost of living index would provide additional material which would be helpful for purposes of analysis. With this thought in mind, the statistical table below has been prepared, indicating the consumers price index, the average industrial wage, and median salaries for engineers in industry (where available) for the years from 1928 through 1958. Source material is indicated by footnote references.

Statistical Table Prepared for Comparison

Year	Consumers Price Index (1947-49 = 100)	Average Industrial Wage (Weekly) [3]	Salaries of Professional Engineers in Industry (Median)
1928	73.3	$ 24.97	
1929	73.3	25.03	$3,674[5]
1930	71.4	23.25	
1931	65.0	20.87	
1932	58.4	17.05	2,677[5]
1933	55.3	16.73	
1934	57.2	18.40	2,569[5]
1935	58.7	20.13	
1936	59.3	21.78	
1937	61.4	24.05	
1938	60.3	22.30	
1939	59.4	23.86	3,136[5]
1940	59.9	25.20	
1941	62.9	29.58	
1942	69.7	36.65	
1943	74.0	43.14	4,364[5]
1944	75.2	46.08	
1945	76.9	44.39	
1946	83.4	43.82	4,740[5]
1947	95.5	49.97	
1948	102.8	54.14	
1949	101.8	54.92	
1950	102.8	59.33	
1951	111.0	64.71	
1952	113.5[1]	67.97	8,420[6]
1953	114.4	71.69	
1954	114.8	71.86	8,940[6]
1955	114.5	76.52	
1956	116.2	79.99	9,870[6]
1957	120.2	82.39	
1958	123.0[2]	81.04[4]	

[1] Figures for 1928 through 1951 from CCH Labor Law Reporter, Vol. V, p. 50, 931.
[2] Figures for 1952 through 1958 taken from Monthly Labor Review, July, 1958, Vol. 81, No. 7, p. 828. (Price index for 1958 represents a five-month average, Jan. through May, 1958).
[3] Average weekly earnings of Production Workers, All manufacturing 1909-1958, National Industrial Conference Board, "Economic Almanac, 1958," p. 251.
[4] Average weekly earnings for 1958 represent a four-month average; Jan. through Apr. 1958.
[5] Comparison of Median Annual Incomes of Professional Engineers, by experience level during 1929-1943. "The Engineering Profession in Transition" table 4. 2a, p. 53, and table 1.2a, p. 8. (The median salaries shown are based upon a 9-12 year experience level).
[6] Median Income, by field of employment, 1952-1956 (Industry), NSPE Income and Salary Survey, 1956, Appendix Table 15, p. 39.
NOTE—The Consumers Price Index is popularly know as the Cost of Living Index.



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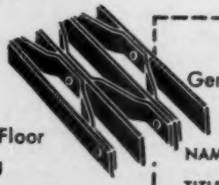

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At The Asphalt Institute

Three-Fold Program Increases To Meet Industry's Challenge

FROM its inception, The Asphalt Institute has worked toward the goal of advancing the most efficient use of asphalt through programs of engineering, research and education. Today, with a field staff manning thirty offices across the United States and with administrative headquarters and research laboratories at College Park, Md., the Institute is quickening the tempo of this three-fold program.

First organized as The Asphalt Association in 1919, the Institute has grown with the demand for asphaltic products and the increasing complexity of modern construction methods. From its early offices in New York, where its first year saw only 600,000 tons of petroleum asphalt used for paving in the United States, to its present headquarters, since 1955, on the campus at the University of Maryland, the Institute has contributed materially to the technology of asphalt paving. Last year saw nearly thirteen million tons of asphalt used in highway construction, and another seven million tons used for maintenance and industrial purposes.

The impressive Blue Ridge Parkway in Virginia is asphalt paved—one of the many roads in the United States which uses this type of surface.

Now, its sixty member companies, who support the Institute through voluntary contributions, produce nearly four-fifths of the petroleum asphalts used in America. Through these members and their overseas affiliates, The Asphalt Institute is recognized the world over as the asphalt industry's engineering authority.

J. E. Buchanan serves as president of the Institute, while Arvin S. Wellborn is chief engineer and secretary.

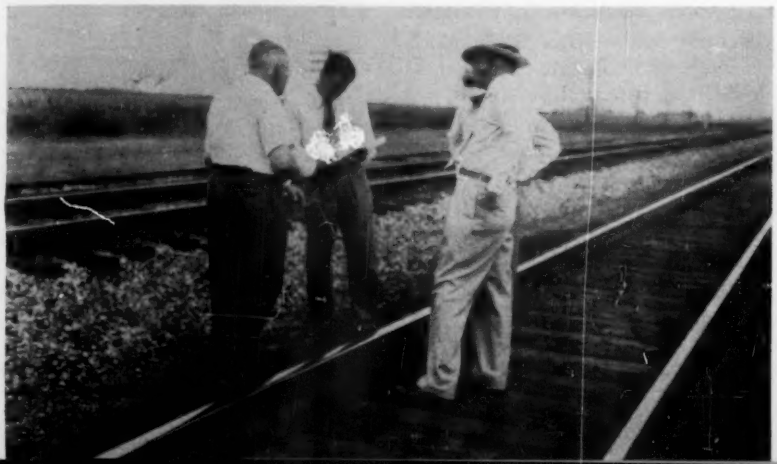
The current research program for the Institute laboratories has the following long-range objectives:

- To develop an acceptable, improved method of asphalt mix design for paving.
- To develop procedures for improvement of base materials with asphalt.
- To develop an improved method of flexible pavement thickness design.
- To develop improved design, inspection and construction practices for all the major uses of asphalt in paving and hydraulics.

There have been many milestones along this road to better paving, many erected through the efforts of the Institute, starting in the early 1920's, when the Institute's engineers attacked the problem of standardizing the grading systems applied to asphaltic materials.

Beginning with a chaotic jumble of paving grades of asphaltic cements, the Institute succeeded in

Engineers of The Asphalt Institute are shown here inspecting the use of asphalt on a railroad roadbed on The Illinois Central Railroad. The successful development of an asphalt treatment on railroad roadbeds is expected to reduce maintenance costs considerably.



The Los Angeles International Airport, one of the busiest airports in the country, has a pavement of asphalt.

reducing the 102 grades confronting the engineer to today's five, four paving grades and one for special and industrial use. A similar program was faced with over 100 grades of SC, MC and RC liquid asphalts at the outset, now there are eighteen and the reduction study is far from concluded.

That this latter program greatly simplified the task of the engineer and constructor is evidenced by the increased use of these materials, an increase that jumped the consumption of liquid asphalts from just over one million tons in 1930 to nearly 5½ million tons in 1955.

DURING the second World War the Institute helped train a cadre of engineers in the construction and maintenance of asphalt pavements for airfields and military roads. These engineers, now returned to civilian life, are continuing to advance the principles of "good construction and timely maintenance" stressed by the Institute.

Recent statistics show that seven of the ten leading civil airfields in the United States with respect to the number of takeoffs and landings are asphalt paved. Included among the seven are Chicago Midway Airport, New York's LaGuardia Airport, Washington National Airport, and Los Angeles International Airport.

In recent years much of the Institute's work has been concentrated on the design and use of heavy-duty asphalt pavements on the nation's turnpikes and expressways. Beginning with the Maine Turnpike and continuing with the fabulous New Jersey Turnpike (that carried an astounding thirty-nine million vehicles in 1957), the Institute's engineers have contributed their knowledge to the advancement of paving mix design and construction methods. It is largely this accelerated increase in engineering know-how that has prepared the asphalt engineer and constructor to meet the needs of the new Interstate highway system.

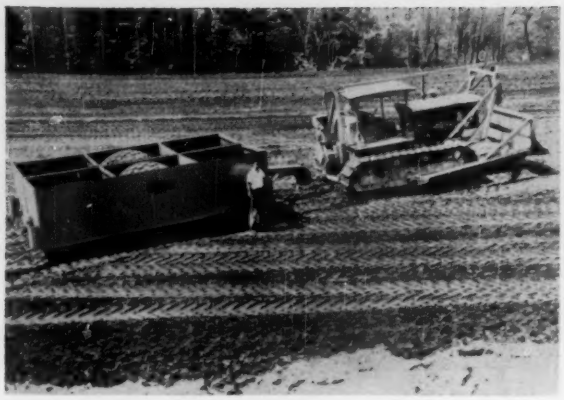
There have been many other achievements in the past forty years. The development of new, high-speed asphalt plants and paving machines, new rollers and construction techniques and the development of the vast farm-to-market road system are a few. But the challenge is still ahead. The 2½ million miles of still unpaved roads in the United States, the development of new uses for asphaltic products and the expanding super-highway systems all present new challenges to a technology still, as it were, in its infancy.

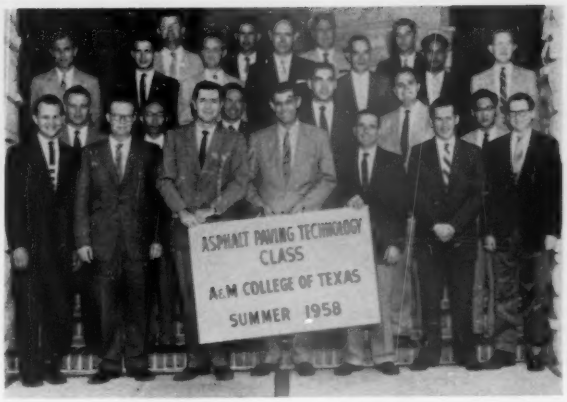
To meet these challenges, the Institute, through its field staff, is constantly at work with engineers and contractors, highway officials, students and laymen across the United States. The Institute field engineer, thoroughly familiar with the particular problems and techniques of construction in his locality, is available for consultation and suggestions to help solve engineering problems as they arise. Working closely with the headquarters laboratory and other research organizations, the Institute's engineer can draw on the most up-to-date information on the uses and application of asphaltic products, often citing new uses and techniques that would have otherwise remained unknown locally.

SUPPORTING field activities are the investigations of the laboratory and engineering and development com-

Drilling a sample core from asphalt paving for test and analysis in the laboratory.

Asphalt groins like this one at Ocean City, Maryland, are becoming increasingly important in the fight against beach erosion.





Construction workers in the photograph at left are shown working on the New Jersey Turnpike. Paved with asphalt, this road carried thirty-nine million vehicles during 1957. On the right are twenty engineering instructors who were enrolled in the third annual seminar in asphalt paving technology and construction conducted by Texas A&M College and sponsored by The Asphalt Institute.

mittees. Through these groups and the Institute project committees, programs of long-range studies are exploring various areas of asphalt technology. Investigations into the design and control of asphalt paving mixes and studies of methods for using asphaltic materials to stabilize soils and upgrade borderline aggregates are carried on side-by-side with the never-ending search for new uses for asphaltic products. Whole new fields are opening in the use of asphalt in hydraulic engineering. Canal linings, reservoir linings and dam facings are being improved and the construction of asphalt groins and jetties has become an important safeguard against beach erosion. Other work is underway on the stabilization of railroad ballast, protection of railroad ties and equipment and the protection of soils against erosion.

John M. Griffith, engineer of research at the Institute, presented a paper in October at the Conference of the International Association for Asphalt held in Paris, France, describing the treatment of railroad roadbeds with asphalt. His report is an example of the thoroughness of Institute engineers when they tackle a research project.

For a great many years, highway engineers have recognized that one of the principal functions of a pavement surface is to provide, in effect, a waterproof covering over the highway structure. In the latter part of the 18th Century, John Loudon McAdam of England developed the philosophy that subsoils could be made to carry any weight if properly drained and imperviously covered. Today, good dainage coupled with an impervious pavement surface are recognized even more than ever as fundamental requirements for highway construction.

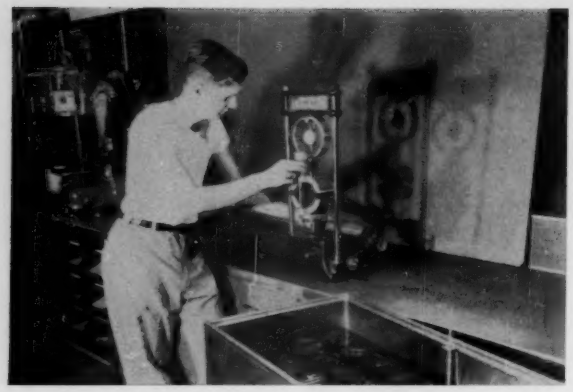
Railroad engineers, however, have adopted a different philosophy in the design of their railbeds, Mr. Griffith pointed out. They normally make use of a coarse, open-textured ballast stone and do not attempt to provide an impervious cover over the surface of their roadbed. Although the open-textured characteristics of ballast stone initially fulfill one of McAdam's requirements, good drainage, progressive degradation of the ballast stone and fine debris gradually fill the voids and result in the entrapment of free water within the ballast. Repetitive loading by railroad equipment works this free water into the upper layer of the foundation soil which, in turn, intrudes into the ballast stone. This results in further fouling of the ballast and unstable load-supporting conditions.

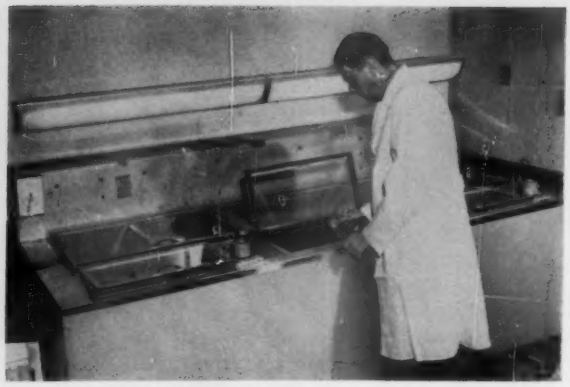
Basically, a railroad roadbed performs the same function as a highway roadbed. Both are built to support repetitive traffic of moving wheel loads, although the manner in which each structure supports such loading is obviously different. At the same time, it appears reasonable to expect that basic principles in highway construction are also applicable to railroad roadbed construction.

With these thoughts in mind, The Association of American Railroads, The Illinois Central Railroad, and The Asphalt Institute planned and constructed an experimental project in 1943 to determine if an asphalt penetration surfacing of a railroad roadbed afforded any specific advantages. The asphalt penetration type of treatment was selected as it was more practical, from the construction standpoint, than the use of asphaltic mixtures.

The section of roadbed selected for the experimental installation was approximately one-half mile in length and was located on the Illinois Central Railroad, about forty miles south of Chicago.

Engineers responsible for this experimental work agreed that it would be desirable to continue the study for about ten years so that a substantial amount of data could be collected over a reasonable period of time by which to fully evaluate the results of the experiment. During this period, careful records





Left photo: A laboratory technician applying the Marshall Stability Test to a paving sample. Right photo: Unique is the word for this multiple temperature control chamber used in making asphalt ductility tests at the laboratories of The Asphalt Institute on the University of Maryland campus. The apparatus, built to specifications written by research engineers at the Institute, boasts three separate chambers, in each of which the temperature can be carefully controlled. Lab Technician Henry C. Krieger prepares to place an asphalt specimen into a sub-arctic climate.

were kept not only on the asphalt-treated section but also on adjacent, untreated sections of track. This data has provided an excellent basis on which to evaluate the benefits of the asphalt treatment.

As a direct result of this study, which was termed both practical and beneficial, The Asphalt Institute and The Association of American Railroads have formed a joint committee to foster further experimental work of this nature. Economically, the successful development of an asphalt treatment for railroad roadbeds is expected to reduce maintenance costs considerably.

Many of the research projects look far into the future, as does the Institute's educational program in training the engineers of tomorrow. Through the Insitute, the member companies make scholarships, fellowships and various grants-in-aid available to students and universities. Institute engineers conduct seminars and lectures for instructors and students at America's leading engineering schools, while the technical publications of The Asphalt Institute are used as texts and references throughout the world.

Now The Asphalt Institute is anticipating the greatest period of construction activity in our history. With our roads and streets and our busy airfields carrying an increasingly heavy burden of traffic, the tempo of activity in the laboratory and in the field is rising accordingly. The Asphalt Institute is gearing to meet new and greater challenges in the years ahead.—**End.**

Recent statistics show that seven of the ten leading civil airfields in the United States with respect to the number of takeoffs and landings are asphalt paved. Shown at left is the Washington, D.C., National Airport, which is among the seven.

FROM WASHINGTON

BY
MILTON F. LUNCH,
N.S.P.E.'s Legislative Counsel

JOB MOBILITY HAMPERED BY TAX INEQUITY

In pure theory taxes should be collected for the sole purpose of providing the revenue necessary to operate the Government. It has been a long time since this precept was followed. Today practically every business or personal decision of consequence may be preceded by an analysis of what the accountants and tax lawyers like to call "tax consequences." Thus, whether you borrow money or pay cash for a new car is influenced by the fact that interest is deductible. Consequently, the Government has taken a policy position favoring the use of borrowed money over cash. In effect, then, the Government has ranged itself

Internal Revenue Service Headquarters

on the side of lending institutions. This somewhat oversimplified example could be multiplied a hundred fold in the personal experience of each reader.

With this introductory basis we come to the proposition that the United States Government is in favor of your retaining your present employment and is opposed to your taking a new job with a new employer! Undoubtedly no responsible official in the Government would agree with this statement, nor will it be found in any book of laws or regulations. It is a statement based on "tax consequences." For engineers, who are alleged to be more fond of changing jobs and employers in recent years than others, the validity of the Government "policy" is important.

In April, 1954, an engineer by the name of Sherrill O. Woodall, working in Dallas, Texas, accepted an employment offer by the Sandia Corporation to work in Albuquerque, New Mexico. The year before, Glenn S. Mills, while an engineering student at the University of Kentucky, accepted an employment offer from Sandia. Part of the "inducement" in both cases was reimbursement for certain expenses incurred in moving to Albuquerque. Woodall received $592.28 and Mills received $446.67. Neither of the engineers reported these sums as income in their tax returns. In due course the two cases went to court, but they actually tested the basic question applicable to several hundred employees in similar situations. Sandia had, in fact, paid out $156,493.51 in 1953 and $174,714.66 in 1954 to reimburse new employees for moving expenses.

The Federal District Court found that the reimbursement of relocation expense was one of the conditions of the offer and acceptance of employment; that Sandia did not intend that the reimbursement would constitute compensation; and that no gain or profit was realized by the individuals receiving the money.

On appeal, the U. S. Court of Appeals for the 10th Circuit reversed the lower court, holding that the sums received were "income" within the Internal Revenue Code, and that a tax had to be paid on such "income." The higher court ruled that Congress intended "to tax all gains except those specifically exempted." Were the sums paid for relocation expense, in fact, gains to the employees? The appeals court said they were in the category of "any economic or financial benefit conferred on the employee as compensation, whatever the form or mode by which it is effected." This was so, the court said, because the money was paid as "One of the conditions which induced taxpayers (Woodall and Mills) to accept employment. . . ." The court agreed that neither received a gain or profit, but "it cannot be denied that they received an economic and beneficial gain. Had the expense not been paid by the employer, the burden would necessarily have been on the taxpayers. The payment was in the nature of a cash bonus as an inducement to accept employment."

Suppose, instead of moving expenses, an employer should "induce" one to accept employment by offering a new car, or one year's rental on an apartment. Few would argue that the market value of the car or the amount of rent was not taxable income. This reason-

ing, in effect, was the court's justification for its decision. Conceding that the money did not represent an actual gain to the employee, it might be expected that they could report it as income and then deduct it as an expense. Not so. The court found itself bound by the tax laws to the effect that "the travel expense must have a direct connection with the carrying on of the trade or business of the taxpayer or his employer. It must be necessary or appropriate to the development and pursuit of the business or trade." In this case both employees admitted that the reasons which motivated them to accept employment with Sandia were personal. "The expenditure had no relation to any service which was being performed for the employer."

Conversely, it is well settled that if an employee is transferred from one location to another for the same employer, moving expenses paid on his behalf are not taxable income to the individual. Why the difference? The Internal Revenue Service say that in the latter case the move is for the benefit of the employer—that the purpose is to preserve or enhance the employer's business profits. There are obviously some arguable assumptions in these doctrinaire principles.

The appeals court threw out as broad a hint as courts ever do to deal with a rather obvious unfair

Senator
Clinton P. Anderson
of New Mexico

situation by noting: "While it may appear to be equitable that expenses incurred in seeking and obtaining employment or in traveling to the place of employment, should be treated as though they had been incurred in the performance of one's duty as an employee, it has, nevertheless, been long recognized that deductions are matters of legislative grace, allowable only when there is a clear provision for them, and they do not turn upon equitable considerations. What should be allowed as an expense deduction is a matter of policy for Congress, not the Courts."

There has already been some serious attempt to deal with the inequity by legislative action. Senator Clinton P. Anderson of New Mexico called attention to the situation affecting his constituents in March, 1957. He pointed out, to make the inequity worse, that Internal Revenue had originally held that the moving expense payments were not taxable income, but reversed this position in 1955. Relying on the earlier Internal Revenue position the Government, through Sandia, had told the employees that the payments would not be taxable. Senator Anderson also emphasized that the extensive recruitment program costing several hundred thousand dollars was for the ultimate benefit of the Government and that the engineers and other scarce personnel needed "could have obtained employment or stayed on their jobs with comparable salaries much nearer their homes than Albuquerque." Senator Anderson introduced a general bill to amend the tax laws to exclude from taxable income money received from a new employer as reimbursement for moving expenses. The bill was not acted upon, but when an omnibus technical tax bill was considered later in the session, Senator Anderson was successful in incorporating an amendment to the Senate version which would have had the effect of a private bill for the relief of the employees in the Sandia situation. Unfortunately, however, the Anderson amendment did not survive the conference and was not included in the final bill, as passed. The final act of the Sandia-Woodall-Mills drama was played last month when the Supreme Court declined to review the 10th Circuit decision.

Payment of moving expense for new employees is such a universally accepted policy today that the tax aspect becomes significant, even though the amount of tax for each affected individual may be only a few hundred dollars. A recent survey discloses that the average cost to employers for moving employees is $1,197.26, covering such items as moving, packing, storage, finding new home, selling old home, etc. To meet the competition of private employers, Congress at the request of the executive agencies, passed legislation in the previous session to allow the agencies to pay the travel and moving expenses of newly hired employees and their immediate family in engineering and other key classifications. The stated purpose of the new law is to benefit the Federal agencies.

Earlier this year NSPE brought this development to the attention of the Internal Revenue Service, and asked how the purpose of the legislation could be reconciled with the tax ruling which reduces the benefit to the individual (and thereby to the prospective employer) by taking back part of the money paid for expenses which actually never reached the pocket of the individual involved. Internal Revenue in due course thanked NSPE for its interest and its views, but said it could not comment on the substance of the problem, except upon the request of a congressional committee.

Taxes are always a big subject in every Congress. The 86th Congress should prove no exception. Among the hundreds of proposals to reduce, revise, eliminate or add taxes there should be consideration of the inequity discussed above. Unfortunately, the Treasury comment on this proposal, like so many others, can be predicted: "Such an amendment will cause a revenue loss of $.... million." To which a Congress facing a peacetime deficit of an estimated $12 billion may find it expedient to suffer the continuation of one more inequity out of many inherent in a complicated maze of tax laws and rulings.

Vitruvius to Hoover:

The Classics of Engineering Literature

By

WALTER JAMES MILLER

Associate Professor of English, New York University

Panning for gold. One of the original woodcuts from *De Re Metallica*.

TIRED of waiting for a Latin scholar to do the job, Clemens Herschel, hydraulics engineer, rendered Frontinus' *Aqueducts* into English and published it with twelve chapters of his own comment.

Soon after, Herbert Hoover and his wife translated Agricola's *De Re Metallica* and published it with historical introductions and scientific notes.

More recently, the Newcomen Society printed John Smeaton's hitherto unpublished *Diary of His Journey to the Low Countries, 1755*. Rensselaer Polytechnic issued a 28-page bibliography of the *technical* writings of D. B. Steinman. A prominent scientific publisher put out a critical anthology of major engineering authors, and a magazine for English teachers ran an article on the classics of engineering writing!

Numerous projects like these now make it possible for us to get an over-all picture of the growth, the nature, and the quality of the literature of engineering.

Which works emerge as classics? How do they compare with the classics of other professions—with Hippocrates in medicine, Darwin in biology, Plato or Bertrand Russell in philosophy? How and what have these works contributed to the history of thought? Have many engineering writers succeeded in reaching the general reading public?

In short, how do the major engineering writers rate *as writers?*

To do justice to these questions in a brief survey, let us limit our discussion to selected writers in the direct line of descent of the American engineer. Like all American writers, the American engineering writer traces his literary ancestry back to the British; then to the early Continental authors; and finally back to the ancients.

1. Roman Classics

The great-great-ancestor of all Western engineering authors is Marcus Vitruvius Pollio, whose *Ten Books on Architecture*, written for Roman builders almost 2000 years ago, discusses problems that today would involve civil, military, mechanical engineers as well as architects. He sums up all the ancient world knew on subjects like city-planning, fortifications, harbors, machines, and timepieces.

Reading Vitruvius, we discover that the ancient master-builder was a man of great professional dignity. He was expected to "be educated, skilful with the pencil, instructed in geometry, know much history, have followed the philosophers, understand music, have some knowledge of medicine, know the opinions of the jurists and the theory of the heavens." He was expected to observe a code of ethics; Vitruvius enjoins him "not to be grasping nor have his mind preoccupied with the idea of receiving perquisites," but to be just and incorruptible. And he approached his work with a scientific attitude; Vitruvius snubs superstition, prescribes experiments for the understanding of nature, searches the literature on every point under discussion. (Most pre-Vitruvius literature is now lost.)

On such matters as theory of materials Vitruvius is of course now out of date; but it is remarkable how little we could teach him today about writing. He tried successfully all the literary devices known to the conscientious author. His metaphors are simple, functional: "Knowledge is the child of practice and theory." His examples are pithy, memorable. His descriptions—for instance, of pozzolana cement—are often exciting. His organization of his material is faultless; he anticipates questions likely to occur to the reader, always carefully orients him.

THE only other major Roman work to come down to us is the investigation report on the aqueducts of Rome (97 A.D.) by Sextus Julius Frontinus. Here we have the just, incorruptible Roman engineer in action, exposing inefficiency, theft, fraud, setting up procedures to in-

sure an increased flow of purer water through 240 miles of conduits. Frontinus' writing sparkles with neat anecdotes, sly sarcasm, apt figures of speech: he sees water rushing in from the aqueducts and slowing down in the catch-basins as "taking fresh breath after the run." He is aware that not all readers want to plow through the raw data; he suggests a detour to the next interesting topic!

Two briefer pieces of Roman writing are also significant. Reading Caesar's *Gallic Wars* (45 B.C.), we wonder how many schoolboys, down through the generations, have first been attracted to engineering by his remarkable description of his bridge across the Rhine? How exciting to the boy-reader that Caesar could so design a bridge that the very strength of the river would add to the strength of the foundations! And engineers are eternally grateful to Nonius Datus for his memorandum (152 A.D.) describing his difficulties with contractors, who almost built two tunnels where he had designed one.

2. Renaissance Classics

After lying in a library for centuries, manuscript copies of Vitruvius and Frontinus were rediscovered by an Italian scholar about 1429. Modern engineering publishing got its start when these works, among the first books to be printed, went through many editions in Latin; finally they were translated into all the major Western tongues. Vitruvius was studied, for practical purposes, by leading master-builders from Leonardo da Vinci (1452-1519) to Thomas Telford (1757-1834).

New writings of the Renaissance were mainly in the field of metals engineering. In the sixteenth century manuals on mining, smelting, alloying poured from the presses in France, Italy, and Germany. The first great work was *De La Pirotechnia* (1540) by Vannoccio Biringuccio, whose discourse on the fires of metallurgy is climaxed by a poetic passage on the fire of love, "the fire that consumes without leaving ashes." (This treatise was composed before narrow specialization set in.)

The outstanding work of this period was Georgius Agricola's *De Re Metallica* (1556), which took twenty-five years to prepare and reigned as the standard text for almost two centuries. His defense of the metallic arts ranks as one of the great intellectual efforts in the struggle of science against ignorance and superstition. He skilfully restates all the arguments of the enemies of mining, pulverizes them by logical analysis. (Is it contrary to nature to dig up what God has concealed? *Then why fish!*) He emerges victorious with an eloquent description of man without metals, inept and inhibited in farming, hunting, sewing and building. "Men would pass a horrible and wretched existence in the midst of wild beasts; they would return to the acorns and berries of the forests."

Agricola's respect for skilled workers, his assimilation of craft knowledge into a scientific treatise, mark a turning point in technics.

Above: Another woodcut from Agricola's *De Re Metallica*. Divining was disapproved by the early scholar-writer. He wrote that a miner should be a "serious man . . . skilled in the natural signs" instead of using the divining rod.

Left: Shafts and tunnels were dug by miners. Wrote Agricola: "Now when a miner discovers a *vena profunda* he begins sinking a shaft and above it sets up a windlass, and builds a shed . . . to prevent the rain from falling in."

The author writes that the name of Dr. D. B. Steinman, above, is "certain to remain on any bibliography of major engineering authors."

Engineer-statesman Herbert Hoover is shown at his desk during World War I, about the time he and his wife translated *De Re Metallica* from the Latin.

His descriptions of processes and apparatus are models of lucid technical exposition. It is interesting to note that although he had his book illustrated with 289 drawings, he makes the text absolutely self-explanatory; the drawings are a supplement to, not a substitute for, the literary description.

Agricola's exalted conception of the preparation for and practice of mining engineering—which "excels in honor and dignity"—reintroduced the professional standards of Vitruvius into modern literature.

3. British Classics

Engineering writing in English was sparse before the eighteenth century. Cornelius Vermuyden, Dutch expert commissioned to repair the Thames embankments, delivered a "discourse" on Fens drainage in 1652. And Andrew Yarranton's *England's Improvement by Sea and Land* (1677) assessed the country's potential, charted its engineering future. Still, native engineering got off to such a slow start that John Perry's *Account of the Stopping of the Daggenham Breach* (1721) is known as one of the *earliest* reports.

When John Smeaton, writer on scientific subjects decided about 1754 to specialize in engineering, he found that there wasn't enough systematic writing in English to educate him; he had to study the Continental authors. But Smeaton remedied this situation. After a busy life of work on engines, canals, and mills, he began to rewrite his reports and notes into organized commentaries. His *Narrative of the Building of the Eddystone Lighthouse,* planned as the first of a series of narratives, appeared in 1791. Smeaton died soon after, but his associates carried out his project as best they could, publishing *Reports* (three volumes, 1812) and *Miscellaneous Papers* (1814). Smeaton's five volumes covered such a wide range of problems and experiments that they served as textbooks for a generation. In effect, Smeaton had founded the English literature of engineering.

His reports are famous for the way he discusses profound technical subjects in the simplest language. His *Narrative* is the epic of engineering. Here we have not only a full scientific account of a major project from the slow formulation of an idea to inspection of the finished structure, but also the personal, emotional story of the engineer as leader of men in fierce combat with malevolent nature. Smeaton's writing is often poetic, sometimes so suspenseful as to be dramatic. Like most great technical writers, he is master of easy metaphor and analogy. Narrowness of a building's base "rounds it," in effect, "like the rockers of a cradle." If he does not plan carefully, "building the Eddystone Lighthouse with stone" will be like "the rolling of the stone of Sisyphus." He conceives the now-classic lighthouse-torso to be shaped like "the waist of a large spreading oak." One secret of Smeaton's writing is his vast, resilient vocabulary; again and again he delights the reader with the perfect word.

To Smeaton's solid foundation, British engineers have since added a voluminous literature including many works now regarded as "classics."

Thomas Loudon McAdam's second book, *Remarks on the Present System of Road Making,* published (1820) by order of the House of Commons, went through nine British editions. The famous portion of the work, actually, is a report included in the appendix; it contains the crux of the McAdam theory. Again, metaphor makes the writer. McAdam likens his type of road to a "roof" that keeps the earth beneath dry, and the conventional types of road to "reservoirs for water." McAdam's language is succinct, crisp, interesting, but sometimes annoying in its self-advertising and gratuitous hyperbole. In such abuses we see one reason why the profession has since gone almost to the other extreme, demanding austere objectivity and impersonal style.

More professional in tone, in the modern sense, are Thomas Tel-

ford's reports, written during the same period, which give an exciting picture of the British engineer at the dawn of international prestige; several of Telford's brisk, *marching* reports are addressed to heads of state. (Telford, we shall see, was ambitious as a writer.) Telford's associate, Thomas Tredgold, a prolific author, is remembered especially for his work on the Charter of the Institute of Civil Engineers (1828), for which he composed his famous definition of engineering as "the art of directing the great sources of power in nature for the use and convenience of man."

The greatest engineering writer in the English (perhaps in any) language was William J. M. Rankine; his one hundred and fifty papers and his series of treatises (1858-1869), dealing with engineering on the highest philosophical, mathematical, scholarly level, enjoyed a phenomenal career. *Manual of the Steam Engine* reached its thirteenth edition in 1891; *Manual of Civil Engineering* its twenty-third in 1908; *Manual of Applied Mechanics* its twenty-first in 1921, sixty-three years after initial publication! Translations were in use in many countries.

Rankine organized the previously scattered components of engineering thought into one vast "connected system of principles" which he gave to the world in *teachable patterns*. To this miracle he added much new creative work; *Steam Engine*, for example, contained *as one of its chapters* the first systematic discussion of modern thermodynamics, of which Rankine was a founding father. In the introductory sections of *Steam Engine*, he made a major contribution to the philosophy of science when he characterized the two modes of mechanical progress "not as the practical and the theoretic, for that distinction is fallacious," but as "the empirical and the scientific."

Reading Rankine today is still one of the supreme experiences in logical development of ideas. With unerring syntax, he handles ponderous masses of material in almost elegant fashion.

4. American Classics

Through such works as *Encyclopaedia Britannica* (1798 edition) and McAdam's *Remarks*, British engineering writers exerted tremendous influence on early American practice. But by mid-nineteenth century the relation between the "old country" and the "new" was one of *reciprocal* influence. For example, valuable American contributions to the theory of structures, made by Squire Whipple's *Work on Bridge-Building* (1847) and Herman Haupt's *Theory of Bridge Construction* (1851), earned their rightful place in Rankine's great synthesis of engineering science. Soon the American literature, with writers like James B. Eads and Arthur M. Wellington, was commanding a world-wide audience.

In 1868 Captain Eads turned a great defeat into a great triumph, mainly by his literary talent. His St. Louis River bridge project had met every setback, floods, timid financing, opponents willing to exploit popular fear. Eads composed a magnificent 58-page report explaining the "plan of the structure, principles involved in its construction, and reasons for its preference," avoiding "all technicalities not understood by every one;" but at the end he gave "all the scientific data, principles, and formulae" in a way calculated to satisfy "the most critical engineer." We have here an early example of that ingenious literary device for satisfying the needs of a mixed audience, now known as the "double report form."

ARGUING in the best Agricola traditions, Eads neatly demonstrates why an arch was cheaper than a truss, and then dismantles his opposition's claim that "there was no engineering precedent for a span of 500 feet." Not satisfied with winning on the level of facts, Eads bores down to the bedrock of principle. First he shows that there *have* been spans of such length (his opponents had counted on popular ignorance of this), but suppose there *hadn't* been an engineering precedent? "Must we admit that because a thing never has been done, it never can be, when our knowledge and judgment assure us that it is entirely practicable? This shallow reasoning would have defeated the laying of the Atlantic Cable; the spanning of the Menai Straits; and left the terrors of the Eddystone without their warning light. The Rhine and the sea would still be alternately claiming dominion over one-half the territory of a powerful kingdom, if this miserable argument had been suffered to prevail."

Financiers and engineers everywhere studied the Eads report; scientific publications praised it; public confidence was restored.

Eads was in demand as a speaker at public occasions, some of them in honor of national figures like President Johnson and ex-President Grant. In his oral compositions the captain successfully indulged a fondness for magniloquent rhetoric. His *Addresses and Papers* (1884) comprise 650 pages of small type.

Wellington's *Economic Theory of the Location of Railways* (1887) was the first American treatise to command attention as a literary work. Principles set down in this 930-page classic have become part of the engineer's thinking, especially in investment analysis; because of Wellington's brilliant language, some of these principles have become proverbs of the profession. For Wellington was master of the memorable sentence. "It would be well," he declared, "if engineering were less generally thought of . . . as the art of constructing; in a certain sense, it is rather the art of not constructing; or to define it rudely but not inaptly, it is the art of doing that well with one dollar, which any bungler can do with two after a fashion." And while the "ill-designed bridge breaks down, the ill-designed boiler explodes, . . . and the bungler's bungling is betrayed," a poorly planned railroad fails through a "gentle but unceasing ooze from every pore which attracts no attention." Wellington called for continuing originality and initiative, exposing mediocrities and imitators. "A copyist," he pointed out, "is not a successor."

In contrast to Wellington, who wrote with natural talent and extravagant love of the very sound of words, we have several American writers whose works have become

classics mainly through the hard labor of relentless logic. For example, Benjamin Garver Lamme's papers (about a third of which were published in book form in 1919) enjoyed profound influence during his own lifetime and still exert a fundamental influence in electrical engineering textbooks. And Frederick W. Taylor's classic paper on belt transmission (1903) and his *Principles of Scientific Management* (1911) have changed the very nature of modern industry. Yet these writings are devoid of any literary quality at all except that one which can be achieved by painstaking attention to readers' needs: utter clarity in arrangement of ideas.

5. Contemporary American Writers

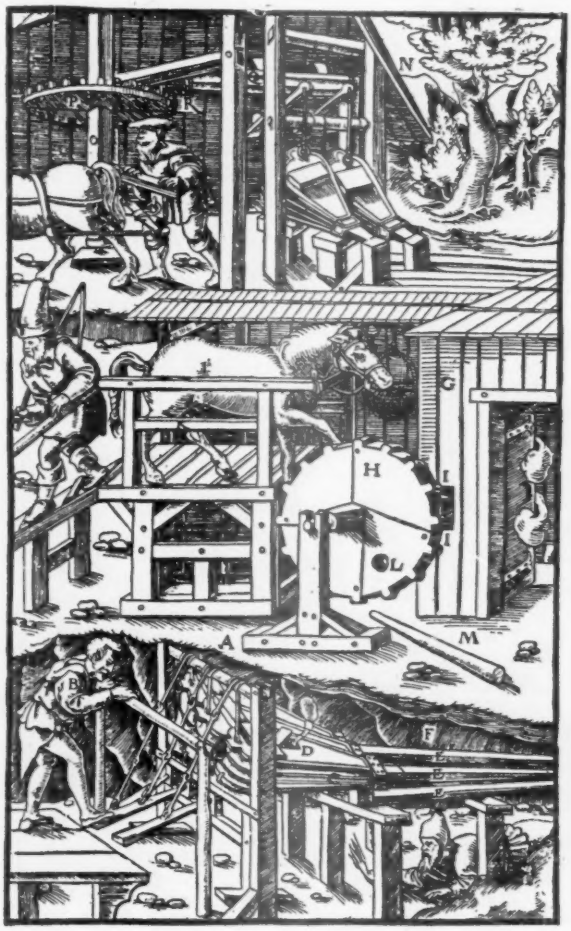
It is risky and even contradictory to try to pick out the "classics" of contemporary writing; one of the implications of the word "classic" is that the work survive the test of time. Still, literary criticism can't have much value unless it attempts judgments and recognizes the superior works of the day.

Most critics would agree that of the living engineering authors, Herbert Hoover certainly deserves to be called a "classic" writer. In his *Principles of Mining* (1909), a standard text for a generation, and in his *Memoirs* (1951) and elsewhere, he conceives and describes the nature and duties of the profession in a noble manner worthy of Agricola and Vitruvius. In such works as his *Report on the Mississippi Flood* (1927), in which he pictures the engineer face to face with a titanic enemy he must "cage," Hoover set high standards for scientific journalism in the public service. In his edition of *De Re Metallica,* he made significant contributions to the history of science, including a claim for Agricola as the "first to found any of the natural sciences upon research and observation." In all his writing, Hoover establishes a suitable structure for his ideas, achieves a mood of sincerity, devises simple, effective metaphors.

ANOTHER name certain to remain on any bibliography of major engineering authors is D. B. Steinman. He has published hundreds of interesting, sometimes exciting, pamphlets, articles, papers, books on the mathematical, esthetic, structural, ethical, theoretical facets of bridge building. Typical of his cogent, swift prose, his masterful attack on technical subject matter, is his paper on *The Design of the*

(Continued on page 40)

In this drawing Agricola showed how tin ore was washed by diverting a stream into a ditch near the deposit.



This bellows arrangement, operated by horse—or manpower, was an early idea for ventilating mines.

—Drawings courtesy of *Scientific American.*

Engineers Give an Underdeveloped Area a Future with

THE KARIBA PROJECT

The Engineer at Work

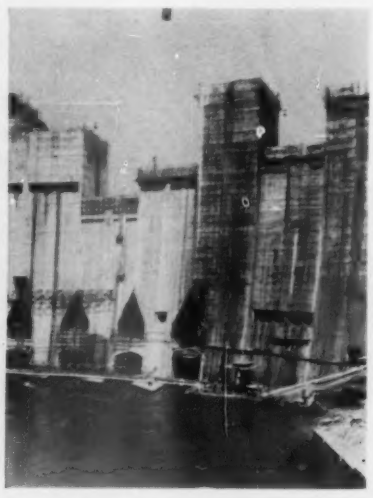
THE site of the proposed one-quarter billion dollar Kariba Dam is two and a half miles downstream from the entrance to the Kariba Gorge on the River Zambezi which separates Northern and Southern Rhodesia in Africa (see map). By road it is about 240 miles from Salisbury and 120 miles from Lusaka. By river it is about 300 miles from the Victoria Falls. Although a few more feet of head might have been developed by placing the dam at the downstream end of the gorge, a thick layer of riverine deposits would have made the building of the dam more costly, the diversion of the river more difficult and, in particular, the time of execution more indeterminate. At the upper end of the gorge drilling has proved sound rock at river bed level.

The scheme of development includes a concrete arch dam having a height of about 420 feet above the foundations. The length of the dam along the roadway will be about 1,900 feet.

The dam, which is being built for the Federation of Rhodesia and Nyasaland, will raise the dry weather river level by about 340 feet and will create a reservoir extending in a south-westerly direction for 175 miles and terminating in the lower end of the gorge which lies downstream of the Victoria Falls. The approximate surface area of the reservoir will be 2,000 square miles and the total quantity of water stored will amount to about 130 million acre-feet—more than four times the capacity of the Hoover Dam in America, at present the world's largest man-made lake.

It is proposed to provide four spillway gates in the centre of the arch dam, the dimensions of each being thirty-one feet by thirty feet, approximately. The discharge will cascade into a stilling pool immediately below the dam. The base of the stilling pool will be concreted to avoid erosion and it will be possible to dewater it for inspection at times when no spilling is taking place.

During the period of load build-up after the reservoir has been filled, there may be periods when the reservoir will spill heavily. Once the turbines have been in-



The Dam was begun in 1955 and the first turbo-generator set is due for completion in 1960.

stalled to the full capacity of the scheme the spillage will be reduced to a minimum, and maximum use will be made of flood storage in the reservoir for the generation of power.

The Power Stations

Two underground power stations will be constructed, the first within the right bank of the Kariba Gorge and the second within the left bank immediately upstream of the dam abutment. The first power station, which will have an over-all length of 460 feet, will accommodate six turbo-generators. The second power station will have equal or greater capacity.

The intakes for the underground power station will be sited immediately upstream of the dam. There will be one intake for each of the six machines, and in order to operate two machines at the earliest possible date two temporary intakes will be constructed at a low level. When the reservoir has filled the low level intakes will be sealed off and the permanent high level intakes used instead.

The intakes will lead the water into vertical shafts. The upper part of these shafts will be lined with concrete and the lower part will be reduced in diameter and lined with steel. The water turbines will be of the vertical-shaft Francis type designed for an output of 140,000 b.h.p. (equivalent to a generator output of 100 mw) at a net head of 303 feet which corresponds to a reservoir level 10 feet below the normal maximum of 1,590 feet.

THE generators, which will be direct coupled to the turbines, will be designed for a continuous maximum output of 100,000 kw at 0.9 power factor, three-phase 50 cycles. They will be of the synchronous closed-air-circuit, water-cooled type.

The physical size of the generators will be such that it will be impracticable fully to erect and test them in the manufacturers' works. Each generator will be split into components of a size that can be transported and each rotor will have to be completely assembled on site. Each stator will be in about six parts.

The water discharged by each power station will be returned to the river through three tailrace tunnels and for the sake of economy one of these will discharge into the diversion tunnel. Regulation of the turbines will be facilitated by the provision of a series of surge chambers located on the downstream side of the power station.

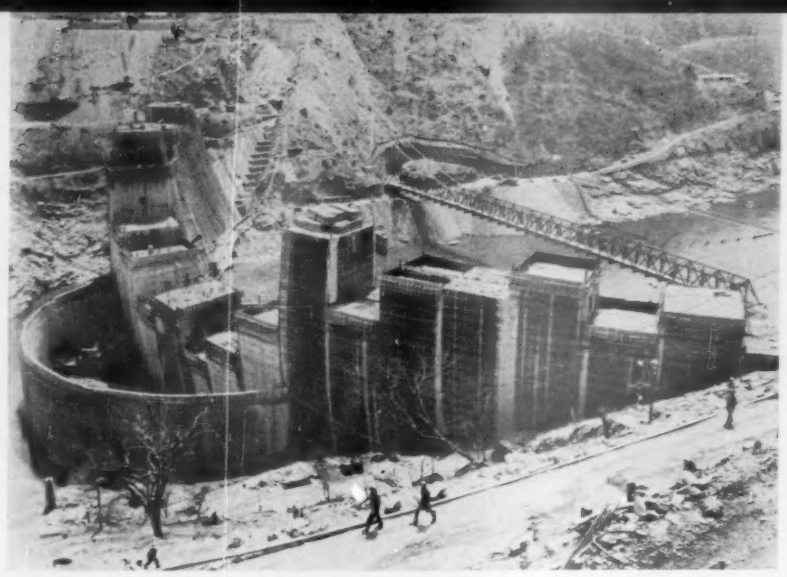
Entry to each power station will be gained through a sloping tunnel from the access road, just upstream of the tailrace outfall. In addition access shafts will be provided for cables, ventilation, etc.

The control room and administrative offices will be at ground level, some 650 feet above the power station floor level. For access between them and the power station, two electric lifts will be provided. One will be a high-speed type of about 6-person capacity, and one a slower speed type of about 12-person capacity which will also be used for taking down small items of equipment.

The voltage of the generators will be stepped up to the voltage of transmission by means of single-phase transformers located in an independent underground gallery adjacent to the generator hall. The output from these transformers will be carried by cable to an outdoor switching station from which the 330 kv transmission system will radiate.

Transmission

Energy will be transmitted from Kariba to destinations at Kitwe, serving the Northern Rhodesian Copperbelt; Norton, serving the Salisbury area; Sherwood, serving



The Dam will create a reservoir on the Zambesia River 175 miles in length.

ESTIMATED CAPITAL COST

Item	Amount (£ million)	
Civil Engineering		
Estimated Cost of Works	32.0	
Contingencies and Engineering	6.4	
		38.4
Mechanical and Electrical		
Estimated Cost of Works	18.5	
Contingencies and Engineering	3.7	
		22.2
African Resettlement and Board Costs		4.2
Interest and Commitment Charges		7.8
Total Estimated Cost		72.6
Reserve for Inflation and Additional Works		7.4
Grand Total		80.0

Shown on this page are two additional views of the Dam.

the Electricity Supply Commission; and Bulawayo, serving the Bulawayo area. The power will be transmitted at 330 kv through steel cored aluminum conductors. There will be two conductors per phase and two earth wires. It is interesting that although the Federation is the second largest producer of copper in the world, the use of this material for conductors has been ruled out on the grounds of price.

The present plan of development envisages that priority will be given to the line from Kariba to the Copperbelt as it is of the utmost importance to bring power to that area at the earliest possible date if restrictions on copper production are to be avoided. Other priorities have not been finally decided but it is clear that the line interconnecting Salisbury, the Electricity Supply Commission and Bulawayo must be completed very soon in order to make the best use of the existing thermal stations, to meet the combined load in these areas. The first line to the south will be to Sherwood, where it will connect with the line linking the three main Southern Rhodesia undertakings, and is planned for commissioning early in 1961. Thereafter development of the transmission system will depend on load growth, and so far as can be seen at present will proceed as shown in the accompanying diagram.

THE firm power available from Kariba will depend upon the average head available at the turbines, and the average firm flow of the river.

A provisional estimate of the firm flow available for power—this figure excludes spillage and evaporation losses—is 29.5 million acre feet per year, which is equivalent to a continuous discharge of 40,800 cubic feet per second. The resultant estimate of firm annual energy output is 8,180 million kilowatt hours.

An idea of the size of the complete hydro-electric undertaking is given by the following comparisons. Its installed capacity of 1,200 megawatts will be ten times the capacity of Umniati, which is at present the biggest station in the Federation. Kariba's eventual output will be more than three times the output of all existing stations in the Federation combined. Its capacity will be more than twice that of the projected Volta River scheme and ten times the present planned capacity of Owen Falls. Only two existing hydro-electric schemes in the world are bigger in terms of installed capacity than Kariba, namely the Hoover Dam (previously known as the Boulder Dam) and the Grand Coulee Dam in the United States. Three other schemes are under construction in North America which will be somewhat bigger in terms of installed capacity, namely, St. Lawrence, Kitimat and Chief Joseph, and it is understood that the Soviet Union is building hydro-electric stations at Bradsk and Krasnoyarsk which will be larger than Kariba. Nevertheless, Kariba will rank as easily the largest power station in Africa and will be much bigger than any existing or projected stations in the United Kingdom. Because of its high load factor it seems probable that in terms of annual energy output it will be the largest station in the world.

System Operation

In the first year of operation—1960—Kariba will be generating under a reduced head of water and the two sets which will have been installed will be used entirely to supply the Copperbelt. In 1961 more water will be available and two more sets will be installed in order to begin supplying power to Southern Rhodesia. The fifth set will be installed in 1962.

The power for the Copperbelt will be supplied on a contract basis by the Board to the Rhodesia Congo Border Power Corporation, who will distribute to the mines and the mine townships, including Ndola. The heads of an agreement between the Power Corporation and the Board have been drafted but it is naturally far too early to complete the contract at the moment. The essential thing, however, is that the Copperbelt shall have first priority for Kariba power and that supply will be arranged on a mutually advantageous basis. Quite apart from the standard price to be paid for electricity, the copper mining companies have voluntarily offered to pay a surcharge of ten million pounds over the years 1961 to 1967 as a generous demonstration of their confidence in the future of the Federation and as a contribution to general development.—End.

Dues Increase Necessary to Finance Society Activities

By

JOHN D. COLEMAN, P.E.

Chairman, Committee on Society Income

Members of NSPE have recently received material pertaining to the financial needs of the National Society, in connection with the Voluntary Fund Campaign, through a number of reports in the AMERICAN ENGINEER and from their state and national officers. The response to the Voluntary Fund Campaign has indicated a sizeable number of members are most anxious that the programs of NSPE not only continue without lessening but that the challenges of professional engineering as being presented to the National Society be met wherever possible. All of the members will be given an opportunity to express their willingness to support these programs when the question of a dues increase is presented for balloting the latter part of January.

It should be made clear just what will be voted on at that time.

The NSPE Constitution currently establishes the limit for national dues at $10. This has never been changed since the Constitution was adopted in 1934. The actual dues of the Society are established by the representatives of the various state societies through the board of directors as contained in the Bylaws of the national organization. The Board of Directors is asking the membership to extend its latitude of dues adjustment such that the dues cannot exceed $20 without amending the Constitution. The Directors, however, want it clearly understood that if the membership approves this recommended Constitutional limit that with this approval the dues will be raised only $3 for the national portion of the professional society dues. Very careful study has gone into the evaluation of the financial situation of the Society. This additional $3 per year per member will provide the National Society with sufficient funds to do a number of programs requested by the members through their state societies.

The Budget Committee in presenting to the Board at the San Francisco meeting a recommended budget for 1959 was able to present a balanced budget only by the elimination of certain existing programs of the Society. At the same time the Budget Committee tabulated for the Board a number of programs which have already been authorized by the Board, or on which there have been repeated expressions of desired implementation. The total added funds which can be used immediately in 1959 amounted to $150,000. The $3 increase in dues would provide somewhere in excess of $130,000 since the National Society currently has some 40,000 P.E. members and 6,000 Junior members. (While a corresponding increase is anticipated in the dues of Junior members, the cost of servicing these members is only barely covered by their dues and hence this increase will not provide additional funds for programs of the Society.)

Previous reports have indicated three basic difficulties requiring increased financing on the part of the National Society:

(1) *Its growth.* This has two correlated expenses—one, the expense of servicing the members before the full value of their dues payment is reflected in the NSPE budget; second, the increased responsibilities that accrue from size, prestige, and position.

(2) *Increased cost of maintaining existing programs.* This again is somewhat caused by size, but it is also caused by the increased ac-

Need for Additional Staff

A dues increase would permit NSPE to augment its headquarters staff to handle the increasing amount of work which has resulted from the Society's rapid growth.

ceptance of the programs. For example, Engineers' Week; NSPE legislative and government liaison programs; the need for more extensive activity in the employment practices area, particularly the increasing threat of unionization of the engineering profession.

(3) *The inflationary spiral against the fixed income.* Of course, everything the Society provides costs more today than it has in the past. Two items alone reflect a sizeable increased cost to NSPE—one, the increase in postage; second, the increase in transportation, printing, and other items of the budget.

Tailoring the anticipated expenses in 1959 to the $10 dues level resulted in the necessity for eliminating the following items from the budget:

Annual Report, distribution of the Criteria to engineering students, sufficient financing for the functional sections, any membership program other than the Introductory Plan, a revised and current Chapter Handbook, per diem to any of the three Board meetings, a State Presidents' Conference, State Secretaries' Conferences, or provide the much-needed finances for reserve, the Professional Engineers Conference Board, or a modest Contingency Fund.

The success of the Voluntary Fund Campaign will determine the degree to which these items may be reinstated in the 1959 program. Response to date indicates that a number of these items will be made possible through these funds.

The following is an indication of the items which would be provided from the increased revenues resulting from a dues increase:

● *Increased Public Relations*—$24,000. The Public Relations Committee has presented to NSPE a comprehensive report of a number of items which have been approved for implementation as soon as funds can be provided. These items include extension of the film programs similar to "Building for Professional Growth;" increased activity to the general public, outlining the importance of engineering and engineers work with writers, editors and public relations people to provide a better understanding of engineers and their work; increased activities for Engineers' Week, including more work in television, films, and supporting material for local chapter and state activities.

● *Professional Engineers Conference Board for Industry*—$20,000. Resumption of the extremely worthwhile research on the engineering profession, what it does, how it does it, and the conditions under which engineers are most effective.

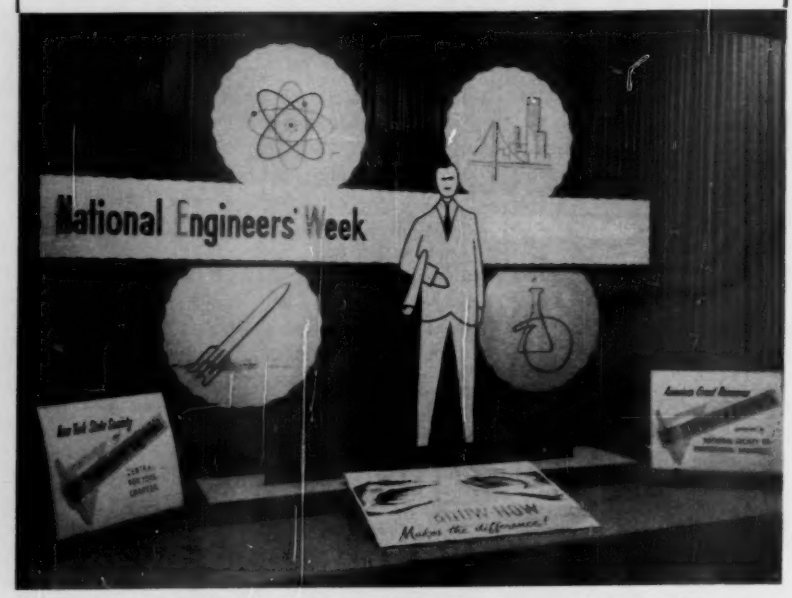
● *Annual Report*—$10,000. This major public relations activity in acquainting the members of NSPE with the activities of the Society carried on in their behalf could not be continued under the present dues structure. Increased dues would permit this annual publication.

● *Additional Financing of Functional Sections*—$3,000. The recent development of functional sections by which the Society can be more effective in resolving the problems and activities of groups of engineers because of their type of employment has been hampered by the inability of the Society to provide sufficient funds for meetings, staff work and other essential elements of the functional group program.

● *Ethics*—$2,500. The National Society has created the mechanism for more effective and extensive work in the field of ethics but has not been able to provide the necessary financing by which these mechanisms can be most effective. It is essential that the Board of Ethical Review meet regularly and finances are needed for the costs of such meetings, plus the publication and wide dissemination of decisions reached.

● *Additional Employment Practices Activities*—$2,000. As indicated above, a portion of the activity of this vital work of the Society could not be adequately financed in the 1959 budget. While the amount indicated here merely provides for distribution of Criteria and some other minor activities, it is conceivable that a considerable additional financing may be needed if the Society continues its aggressive activity to combat unionism of

Money Needed for EW Program



National Engineers' Week under the sponsorship of NSPE has become an important public relations project and more funds are needed to finance expansion of the annual event.

professional engineers wherever it arises.

• *State Presidents' Conference*—$7,500. As the Society grows, the problem of communication becomes increasingly important. If the Society is to retain its current qualities of grass-roots operation, there must be a continuous flow of communications from the state level to the national, and from the national to the state. The State Presidents' Conference considerably facilitates this flow by bringing together all of the state presidents for a two-day period of discussion and orientation on the various problems with which the Society is concerned.

• *Advertising Promotion, Including Staff, Research, and Material*—$15,000. The Society's publication has continuously improved over the years. It is now a major means of communication within the engineering profession. The Society, unfortunately, has never spent adequate amounts of money in calling the publication to the attention of advertising people as the mechanism of bringing their products to the attention of the members of the Society. The American Engineer Committee is of the opinion that with a modest expenditure of money some additional income can accrue which will provide a better magazine for carrying news of the profession.

• *Reserve Fund*—$10,000. Financial restrictions of the Society for the past several years have prevented it from setting aside any funds for cash reserve. The fund is currently limited to $31,500 of Government bonds. This should be increased extensively for a Society the size of NSPE.

• *Membership Promotion*—$15,000. Membership is, of course, the lifeblood of the Society. Increased membership increases the Society's effectiveness in many areas. There is a need not only to call the Society's programs to the attention of many engineers who are not aware of NSPE's activities, but to increase our efforts toward acquainting all engineers with their professional responsibilities.

• *State Secretaries' Conference*—$4,000. The efficiency with which our three-level organization can operate and the degree to which member inquiries can be quickly and accurately answered depend on the coordination between national, state and chapter levels. It is highly desirable that the state secretaries come together once a year to discuss and iron out procedural methods of our three-level organization.

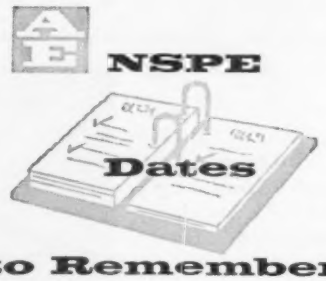
• *Board Per Diem*—$8,000. It has been fundamental in the philosophy of NSPE that a state society should be able to select its most capable members as national directors without requiring any financial underwriting on their part to participate in this important policy-making body. Unfortunately, allowance for expenditures at NSPE meetings had to be eliminated from the 1959 budget. This should be restored.

• *Additional Staff*—$19,000. NSPE still operates with the lowest per member ratio of staff of any major professional society. As the Society grows and these many programs are implemented, it is obvious that we will have to have more staff to take care of the details. Our Washington headquarters is seriously handicapped in its ability to handle the increasingly heavy load in membership, distribution of materials, supplying information, and the staff work involving the activities of committees. Fortunately, the advance planning of the Society provided a headquarters building in which staff expansion is possible. Expansion, however, requires additional equipment, typewriters, desks, etc.

• *Chapter Handbook*—$2,000. The Chapter Handbook was prepared originally and distributed in 1950. A survey in 1956 indicated only about one-half of the chapter officers still had Handbooks. Those that have them, of course, have 1950 material except some minor revisions have been made in the interim. A new Chapter Handbook containing up-to-date information is necessary.

• *Executive Committee Emergency Fund*—$8,000. Careful fiscal planning would provide a contingency or emergency fund under the direction of the Executive Committee which could be used to implement any emergency programs requiring immediate action.

It should be noted that a dues increase will not provide funds to the Society until 1960. A $3 increase for P.E. members plus the $2 increase for Junior members would provide in the neighborhood of $130,000 increased revenue over and above that of 1959. Thus, increased funds for programs such as outlined above primarily come from the full members of the Society. It would be hoped that the increased membership of NSPE between now and 1960 would provide the additional funds necessary that all of the above programs can be implemented with the approval of the dues increase.



to Remember

Professional Engineers of North Carolina—Annual Meeting, January 8-10, 1959, Barringer Hotel, Charlotte, North Carolina.

Louisiana Engineering Society—Annual Meeting, January 15-16, 1959, St. Charles Hotel, New Orleans, Louisiana.

Mississippi Society of Professional Engineers—Annual Meeting, January 16-17, 1959, King Edward Hotel, Jackson, Mississippi.

Texas Society of Professional Engineers—Annual Meeting, January 22-24, 1959, Shamrock Hilton Hotel, Houston, Texas.

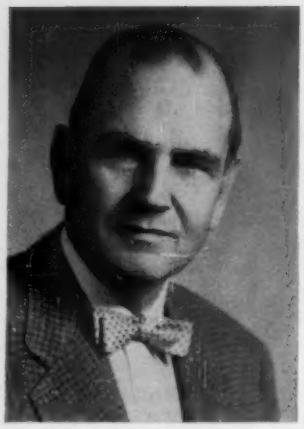
Oklahoma Society of Professional Engineers—Annual Meeting, January 30-31, 1959, Mayo Hotel, Tulsa, Oklahoma.

National Society of Professional Engineers—Winter Meeting, February 19-21, 1959, Dinkler-Tutwiler Hotel, Birmingham, Alabama.

National Society of Professional Engineers—Annual Meeting, June 17-20, 1959, Commodore Hotel, New York, New York.

1959-60 Nominees Are Announced

A NEW YORK man, who has served the three levels of NSPE membership in many official posts, has been selected by the Nominating Committee of the National Society to head the 1959-60 slate of candidates for national office. Harold A. Mosher, of Rochester, New York, has been nominated for the presidency, the Committee has announced.



Harold A. Mosher

Vice presidential nominees selected by the Committee are: W. Earl Christian of Westfield, N. J., Northeastern Region; R. King Rouse, of Greenville, S. C., Southeastern Region; L. Eugene Easley, of Indianapolis, Ind., Central Region; Brandon H. Backlund, of Omaha, Neb., North Central Region; Noah E. Hull, of Houston, Tex., Southwestern Region, and George E. Zelhart, of Fresno, Calif., Western Region. Messrs. Easley and Hull are nominated for a second term. Nominated for a 12th term as treasurer is Russell B. Allen, of College Park, Maryland.

In announcing the names of the candidates, the Committee pointed out that additional nominations may be made by members as provided by the NSPE Constitution. Other names will be placed on the official ballot upon petition of fifty members, all in good standing, provided such petition is received at least one week prior to the printing of the ballot. The closing date for such petitions, which should be sent to the national headquarters in Washington, D. C., is January 10, 1959.

Members of the Nominating Committee are: Robert J. Rhinehart, chairman, W. S. Cottingham, Arnold Dutton, Howard W. Honefenger, Arthur Miller, and J. Vernon Sharp.

Harold A. Mosher, nominee for 1959-60 president, is assistant director of engineering for the Eastman Kodak Company at Kodak Park, Rochester. He was born in Oklahoma City, Oklahoma, in 1907. After receiving his degree from Occidental College at Los Angeles, California, he joined the engineering technical staff at the Bell Telephone Laboratories in New York City. Following further experience with the Engineering Staff of Consolidated Film Industries in New Jersey, he joined the staff of the Eastman Kodak Company rising to his present position.

He has served as president of his local chapter, a member of the Board of Directors of the New York State Society of Professional Engineers and the National Society of Professional Engineers, and is currently serving a term as vice president of NSPE for the Northeastern region. He was chairman of NSPE's Membership Committe during 1957-58.

Mr. Mosher is a member of the American Society of Mechanical Engineers and other organizations.

W. Earl Christian

W. EARL CHRISTIAN, of Westfield, New Jersey, vice presidential nominee for the Northeastern Region, is chief engineer for the Hefler-Snyder Company, of Garwood, New Jersey. He studied in the College of Engineering, University of Illinois, 1916 to 1918, and served with the Corps of Engineers in World War I. He spent about thirteen years with the New Jersey State Highway Department.

During the past twenty-five years, he has been engaged in the contracting and construction field. He is currently chairman of both the Zoning Board of Adjustment and the Planning Board in his home community, Piscataway Township.

Mr. Christian is a past president of the Raritan Valley Society of Professional Engineers, and is immediate past president of the New Jersey SPE. He has served the National Society as a member of the Budget Committee, the Constitution and Bylaws Committee (three years as chairman), and is presently a member of the Policy Review Committee.

R. King Rouse

R. KING ROUSE, of Greenville, South Carolina, vice presidential nominee for the Southeastern Region, heads the R. K. Rouse Company in Greenville, representing several manufacturers of heating and cooling equipment. He organized the firm in 1938. His academic and technical education was secured through attendance at schools in his home State and included the study of mechanical engineering at the Georgia School of Technology in Atlanta, Georgia.

He has been a member of NSPE since 1943 and was active in organizing the South Carolina Society, being its first president in 1948 and served as national director from 1951 to 1957.

Mr. Rouse holds membership in Rotary, Toastmasters, and other local and national organizations, including the Society of American Military Engineers and American Society of Heating and Air Conditioning Engineers, being elected to the 1959 National Nominating Committee.

L. E. Easley

L. E. Easley, of Indianapolis, Indiana, vice presidential nominee for the Central Region for a second term, is owner of the firm of L. E. Easley & Associates, Consulting Engineers. Born in 1908, he was educated at the public and technical schools at St. Louis, Missouri. He is a registered engineer in Indiana, Ohio, and Illinois.

Prior to engaging in private practice, he was associated with the construction industry in engineering and management and was senior engineer and supervisor of civil, structural and mechanical engineering for Allison Division of General Motors at Indianapolis for fifteen years.

Active in chapter and state activities, Mr. Easley was president of the Indiana Society in 1951, following which he served for seven years as national director. He is currently NSPE vice president in charge of the Policy and Operations Group. He is a past director of the Indiana Engineering Council and the Wastes Association. He is active in several civic organizations and Masonic bodies. He is listed in Who's Who in The Midwest and Who's Who in Engineering.

Brandon H. Backlund

Brandon H. Backlund, of Omaha, Nebraska, vice presidential nominee for the North Central Region, is presently the head of a firm of consulting engineers and architects in Omaha. He received his civil engineering education at the University of Nebraska and at Iowa State College where he received his B. S. degree in civil engineering in 1941. He has also had postgraduate training in various Army service schools during World War II.

Prior to World War II, he worked with several engineering and construction firms in capacities of engineer, estimator, and consultant until April of 1951 when he opened his own practice in civil and structural engineering. He is one of the founders and a past president of the Nebraska SPE. Mr. Backlund has been active as a member of the Board of Directors and in committee work since the Society was chartered.

He is a member of ASCE, SAME, AWWA, ACI, and the Nebraska Engineering Society. His other activities include membership and committee work in various civic and service groups.

Noah A. Hull

Noah E. Hull, of Houston, Texas, vice presidential nominee for the Southwestern Region for a second term, is vice president and general manager of the Hughes Gun Company and assistant to the vice president-manufacturing of the Hughes Tool Company. A native of Ohio, he received his B. S. degree from Purdue University in 1917. Prior to his present post, he held executive engineering positions with the General Motors Corporation, the Firth Carpet Company, and the National Gypsum Company.

Mr. Hull is a registered professional engineer, in Michigan, New York and Texas. He has been active in the San Jacinto Chapter, the Texas Society of Professional Engineers, and is currently serving as national director of the National Society of Professional Engineers from Texas. Mr. Hull is a past chairman of the Professional Engineers Conference Board for Industry.

George E. Zelhart

George E. Zelhart, of Fresno, California, vice presidential nominee for the Western Region, has been employed by the Pacific Gas and Electric Company since 1925. He attended Fresno Junior College, 1919-21, and Stanford University, 1922-23.

Prior to his present position, he was employed by the Southern California Edison Company in Big Creek and the Pacific Telephone and Telegraph Company in San Francisco. He served with the rank of major as a member of the Corps of Engineers during World War II.

Mr. Zelhart was among the first engineers to become registered in the State of California. He has been active in both the Fresno Chapter and the California SPE—serving as president of the latter group in 1952-53, and as its national director from 1955 to 1957. He is also active in the fraternal and civic groups of his community.

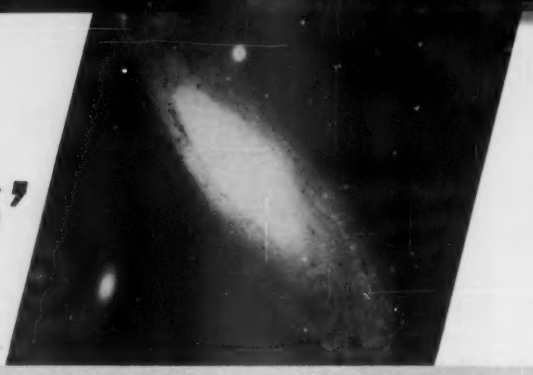
Russell B. Allen

Russell B. Allen, of College Park, Maryland, nominated for a 12th term as treasurer, is assistant dean of engineering at the University of Maryland. A professor of civil engineering, he has also served as head of that department, and acted as coordinator for the design, construction,

(Continued on page 39)

Use these aids for

NATIONAL ENGINEERS' WEEK . . .



HERE ARE the basic promotional aids that will give dramatic impact to your program—the kind of impact that will result in public attention in local newspapers, and on radio and television programs. All these aids have been prepared to show the contributions of engineering to our modern age. Use the handy order coupon below.

1. **One-Minute TV Films:** A set of five one-minute TV films dramatizing the theme of the 1959 National Engineers' Week. Produced under expert supervision to meet network standards, the films call attention to role of the engineer in building for the "age of space." Network TV performers. Each film planned to qualify for public service TV time during station breaks. A set of these five films will give wide coverage to your Engineers' Week program. Price: Set of five films, $25.

2. **"Engineering . . . for the Age of Space:"** A 15-minute tape recorded radio program telling the story of how engineering is bringing about man's new era. Radio network performers dramatize the contributions of the engineer in meeting the challenges that are involved in the exploration of our solar system and beyond. Excellent for use on public service radio time. Price: $6 each.

3. **Lapel Buttons:** A high-quality lapel badge featuring a white design on a blue background. May be distributed to high schools, science clubs, and other groups. Each chapter or state society can set its own price for button sales. Prices: 100 to 500—15¢ each; 500 to 1,000—10¢; 1,000 to 3,000—7¢; 3,000 to 5,000—5¢; and over 5,000—4¢.

4. **Set of Seven TV Slides:** Obtain extensive TV coverage through the Week with these slides displaying poster-type art work and printed copy calling attention to engineering. May be used during all TV station breaks as public service announcements. Price: $10 per set of 7 slides.

5. **Posters:** Colorful 9 x 11-inch pasteboard posters carrying the 1959 Engineers' Week design and theme. This is the basic promotional item for calling attention to the Week. Use on bulletin boards, in window displays, school exhibits, etc. Large size (18 x 22 inches) also available. Prices: 9 x 11, $4 per 100; 18 x 22, $5 per 100.

6. **Paper Banners:** Excellent for display use. Three feet long by 6 inches wide. Has poster design and words "National Engineers' Week" in color. Price: $4 per 100.

7. **National Engineers' Week Seals:** Use these brightly colored seals on all office mail from now through February 28. Poster design printed on 1½-inch gummed paper. Price: $3 per 1,000.

8. **Newspaper Mat Story on Engineers and the Exploration of Our Solar System:** A feature article on the way in which engineering is providing factual answers to questions that only a few years ago were strictly in the realm of speculation. Prepared on mat, with illustration, ready for immediate insertion in daily or weekly newspaper. Price: 50¢ each.

9. **Newspaper Mat Story on What Kind of Educational Background a Graduate Engineer Needs Today:** A feature article on the extent of secondary and college education needed for an engineering degree. Emphasizes the importance of a solid foundation in mathematics and the physical sciences. Prepared on mat, with illustration, ready for immediate insertion in daily or weekly newspaper. Price: 50¢ each.

10. **Logotype:** A metal cut of a poster design to insert in advertising, special sections of newspapers, industrial house organs, magazines, and other printed matter. All state society and chapter publications should have one. Price: $1 each.

11. **"Engineering Builds Broader Horizons:"** A re-issue of the 15-minute tape recorded radio program distributed last year. Just as timely this year. Network performers dramatize the engineering developments behind every phase of the International Geophysical Year. Price: $4 each.

Use this coupon to order your aids now!

National Society of Professional Engineers
2029 K Street, N.W.
Washington 6, D. C.

Sirs:

Please rush me items indicated. I enclose a (check.....) (money order.....) in the amount of $..... I understand remittance must accompany order.

NAME_____
(PLEASE PRINT)

ADDRESS_____

CITY_____ STATE_____

1. .....One-minute TV films @ $25 per set.
2. .....Radio tape "Engineering . . . for the Age of Space" @ $6 each.
3. .....Lapel buttons: 100-500 @ 15c ea.; 500-1,000 @ 10c ea.; 1,000-3,000 @ 7c ea.; 3,000-5,000 @ 5c ea.; over 5,000 @ 4c ea.
4. .....TV slides: set of 7 slides @ $10 per set.
5. .....Posters: regular size @ $4 per 100.
   .....Posters: large size @ $5 per 100.
6. .....Banners @ $4 per 100.
7. .....Seals @ $3 per 1,000.
8. .....Newspaper mat story on engineers and the exploration of our solar system @ 50c ea.
9. .....Newspaper mat story on educational background for engineering @ 50c ea.
10. .....Logotypes @ $1 ea.
11. .....Radio tape "Engineering Builds Broader Horizons" @ $4 ea.

President Eisenhower Salutes 'Week' in Special Message

In a message regarding the 1959 National Engineers' Week, President Eisenhower has declared that he is "heartened by the sense of urgency and public responsibility displayed by American scientists and engineers, and by their determination to be of service to the nation."

In a signed message to NSPE President Clark A. Dunn, President Eisenhower stated that "the observance of National Engineers' Week provides an opportunity to recognize the vital work our engineers perform in maintaining American superiority in technology."

The President called the priority given by engineers and scientists to education "a strong example to us all." He added that "their efforts to alert young people to the importance of careers in science and engineering help to enlarge the basic resources of American intellectual talent."

The President concluded that "it is only by education that we can guarantee the future supply of leadership in all fields of endeavor."

The message from President Eisenhower is the ninth consecutive presidential tribute from the White House on the occasion of a National Engineers' Week observance. As in previous years, the National Society will distribute reproductions of the President's signed message to NSPE affiliates, industrial engineering executives, engineering schools, and interested business and other organizations. Copies of the President's message may be obtained, at no charge, from the National Society headquarters, 2029 K Street, Northwest, Washington 6, D. C. The message may be reproduced in other publications, posted on bulletin boards, or used in connection with engineering exhibits and displays for National Engineers' Week.

TV Films for Engineers' Week

A camera crew moves in for a close-up of the 1959 National Engineers' Week poster in one of the five spot films produced by NSPE for use on television public service time. The films were made in 35mm for distribution to major TV network programs during the Week of February 22-28. The set of five one-minute films in 16mm are available from the National Society at $25 per set. Included in the films are scenes showing the satellite computing center in Washington, D.C., rocket firings at Cape Canaveral, the world's largest radio telescope, atomic reactor experiments, and satellite construction.

CLASSIFIED ADVERTISING

Minimum 3 lines.
Undisplayed, $1.80 per line. Three or more consecutive insertions $1.50 per line each.
Displayed: Same rate as General Advertising.
Positions Wanted: Undisplayed, 90¢ per line. Three or more consecutive insertions 75¢ per line each. Displayed: General Advertising rates, less 50%.
Box Number chargeable as one line.

Mail Box Number replies to:
AMERICAN ENGINEER
2029 K Street, N.W. Washington 6, D.C.

Position Available

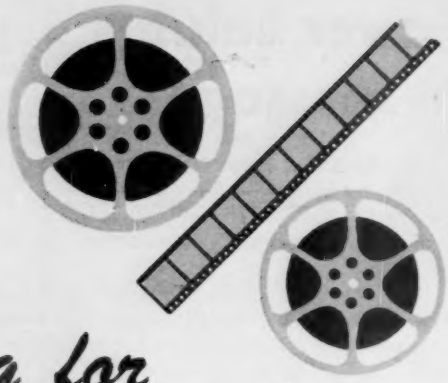
ENGINEER for structural design work in Mpls. Perm. position, good opportunity. Salary $6600 to $7800 depending on experience. Write Bridge Engineer, Soo Line Railroad, Mpls. 40, Minn. Box 1109.

In other Engineers' Week advance planning, many local chapters are building their programs for the 1959 observance around projects emphasizing the theme, "Engineering . . . for the Age of Space." It is generally expected that the current series of lunar rocket firings will result in a moon satellite being placed in orbit by the early part of 1959. This should stimulate a considerable public interest in projects which call attention to the engineer's role in translating scientific theory into the practical reality of the exploration of space.

A 12-page booklet, "A Program in Public Service for Your Firm," is now available, at no charge, from the National Society. The booklet describes the objectives of National Engineers' Week, and points out how industry can participate in the observance through the display of posters and exhibits, guided tours for high school students, career conferences for high school seniors, and other projects. Copies of the booklet have been sent to all NSPE affiliates, and to a list of over 600 industrial executives.

Reservations for the U.S. Steel film "Mackinac Bridge Diary" must be made by January 9. All requests for reservations should be sent to United States Steel, Pittsburgh Film Distribution Center, 525 William Penn Place, Pittsburgh 30, Pa.

NSPE Presents:



"Building for Professional Growth"

Here is a film covering the activities of the National Society of Professional Engineers at the chapter, state, and national levels. A milestone in the NSPE public relations program, "Building for Professional Growth" is a filmed presentation on the values and benefits of Society membership. Activities covered in the film include NSPE efforts in registration; research projects such as the Income and Salary Survey, the Professional Engineers Conference Board for Industry reports; legislative cooperation; National Engineers' Week, and other programs. Also included are scenes from actual chapter, state, and national level meetings.

"Building for Professional Growth" can be shown on any 16mm sound projector. Reservation requests should be made for three choices of dates. Notification of available date will be sent from NSPE headquarters immediately after each reservation request is received.

RENTAL FEE: $10

(Includes 8-page booklet "Ideas For Your NSPE Film Program," and 15-minute talk on NSPE.)

Use this coupon to reserve your film

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
2029 K St., N.W. • Washington 6, D. C.

Please reserve us the NSPE film "Building for Professional Growth" for the following choice of dates:

_____ (1st) _____ (2nd) _____ (3rd)

SHIP TO:

Name_____

Street_____

City_____ Postal Zone_____ State_____

(Make checks payable to National Society of Professional Engineers)

New Society Film Shown to Board At Fall Meeting

A special showing of the film "Building for Professional Growth" was held for NSPE Board members at the San Francisco meeting. The film was shown during the morning session October 24.

The film, produced under the supervision of the NSPE Public Relations Committee, covers the activities of the National Society at the chapter, state, and national levels, and describes the values and benefits of NSPE membership. John L. Pratt, Public Relations Committee chairman, has stated that the film is "one of the most effective tools the Society has ever had for stimulating the interest of potential members."

Chairman Pratt urged that all local chapters take advantage of the film and "incorporate it into their programs for reaching potential members among engineering school seniors and among the professional engineering community."

To date, approximately 65 chapters have used the film. Some of these chapters have held several showings. Reservations have been made for showings through June, 1959.

The 16mm, 20-minute film is available from the National Society for a rental charge of $10. Because of the limited number of prints available, chapters and state societies are requested to list three choices of showing dates. Prints are shipped directly from the National Society headquarters in time for showing on one of the three dates listed. Reservation dates are confirmed by letter from the National Society well in advance of the scheduled showings.

A copy of a booklet, "Ideas For Your NSPE Film Program," and material for a 15-minute talk on the organization and objectives of NSPE are included with each film reservation.

NSPE student chapters may reserve the film at no charge. Such reservations will be accepted by the National Society with the understanding that the showings will be held for student members only.

Greater 'Team Effort' Needed In Fund Campaign, Dunn Says

- About $30,000 Raised in Drive to Date
- Curtailment of Programs Threatened

"A greater team effort instead of a 'let-George-do-it' attitude is needed if the voluntary fund campaign is to be more successful," Clark A. Dunn, NSPE president said recently.

Noting that the fund drive had raised about $30,000 to date, the Society official pointed out that much more money would have to be contributed if several vital programs were not to be discarded during 1959.

"Already, ten per cent of the membership have been heard from

". . . few carrying the load for the many"—Dunn.

and, to their great credit, they have contributed an average of $10 each. But we have the picture of a few carrying the load for the many. This is most disturbing especially among professional people," Dunn added.

"Even if the dues increase is voted by the membership in January no funds from this source will be available for 1959," Dunn said. "That means that such outstanding programs as National Engineers' Week, the employment practices activity, and others will have to be drastically curtailed or stopped altogether. It seems strange that professional men would stand by and let their own programs falter for the sake of a few dollars. We should all remember that doctors and lawyers pay far greater dues to their organizations than does a member of NSPE. Possibly this is a clue as to why they have the professional standing they do."

President Dunn's remarks again emphasized the importance of the fund raising drive as an emergency measure to keep present programs operative. A dues increase (see story, page 31) cannot take the financial pressure off of 1959 which is the immediate worry of NSPE officers.

The fund drive was initiated several weeks ago with the mailing of a solicitation piece to the entire membership. A second and final piece has since gone out and it is hoped that this will encourage many more to send in their contributions.

One unique feature of the drive is the "Project Ambassador" program. All who contribute at least a dollar for every year he has been registered, are eligible for a free trip to one of the following areas of the world: England and Western Europe; Central and South America; Southeast Asia and Australia-New Zealand, or Canada.

All those who qualify must submit along with their contribution a résumé of their experience and background. From these résumés a panel of distinguished judges will select one engineer who, along with his wife, will be sent as a good will ambassador to visit professional engineering societies in other countries, as well as outstanding engineering and scientific installations.

The résumé should include positions the engineer has held during the past five years; contributions made by the man to industry, the public welfare, the engineering profession, and the community. Further, it should list participation in civic, fraternal and professional organizations.

Judges for "Project Ambassador" are C. Y. Thomas, vice president,

This handsome desk name-plate will be given free to all those who contribute ten dollars or more to the fund drive.

Spencer Chemical Co.; William F. Ryan, former vice president, Stone & Webster Engineering Corp., and A. A. Potter, dean emeritus of engineering, Purdue University.

Another unique feature of the campaign is the availability of a personalized desk name plate (see photo) to all those who contribute $10 or more. The name plate is attractively designed, and the name of the contributor is printed in bold white letters, on a choice of gray, black or walnut background.

OFFICERS

(Continued from page 35)

and equipment of the new buildings of the Glenn L. Martin Institute of Technology of which the engineering college is a part.

A native of New Haven, Connecticut, he received his B. S. degree at Yale where he served for five years as an instructor in civil engineering while taking graduate work in structural engineering and architecture. He spent several years as a construction engineer with the Boston and Maine Railroad and was also engaged in private practice before going to Maryland in 1933.

He was instrumental in getting an engineering registration law passed in Maryland and was a founder of the Maryland SPE, serving as its first secretary-treasurer, its second president, and several terms as national director.

Thoughts on Professionalism...

By PAUL H. ROBBINS, P.E.
NSPE Executive Director

The 'Shortage' Again in the Headlines

ARTICLES are appearing once again in the technical, trade and public press presenting figures to show the need for more engineers and scientists. These figures in many instances are statistical tabulations purporting to show demand for engineers as compared to the anticipated numbers who will be graduated in the next five, ten and twenty years.

FOR the most part there is no disputing the figures, but there can be considerable question raised as to conclusions drawn. For the most part, the conclusions reached fail to make some significant distinctions in analyzing the tabulations. Primary among these distinctions is the old problem of the engineering profession; namely, that of definition. One recent survey reported spot checks on the industrial requirements for engineers. By admission these were estimates by personnel people of the number of "engineering" positions which would need to be filled. No attempt is, of course, made to determine the number of such positions which are "engineering" purely by title and/or the positions in which it is nice to have an engineer but if qualified technicians were available the work could be adequately accomplished.

THE second hazardous area of support for the increasing need for engineers and scientists is the obvious shortages which exist because of the rapid advances in certain areas of technology. Areas such as automation, electronics, atomic energy, rocketry, etc., are areas where only recent graduates have had any training and where the technology has advanced so far that for the most part only those with advanced degrees are adequate for the type of work expected.

COMMITTEES of NSPE have been deeply concerned with the conclusions drawn from these studies. At the San Francisco meeting the Society issued a statement urging editors and those concerned with the release of information of this kind to carefully analyze just what is needed for the type of engineering work required by those reporting. The Society went on to state that it is its opinion that deficiencies in engineering and scientific personnel primarily exist in the technician level to support qualified four-year college graduates and in the highly-trained specialists where graduate education is essential. The Society pointed out that current enrollment figures in our colleges indicate that we will graduate fifty per cent more engineers in the next five years than we did in the last five.

THE NSPE and its state societies and chapters have pointed out for several years that a far more effective answer to the question of the need for engineering manpower can be secured by greater concern for the utilization of the technical brainpower already existent in this country. The Society has felt, as evidenced by its cooperation with the President's Committee on Scientists and Engineers, that the regional conferences on utilization of scientists and engineers are an effective mechanism for representatives of industry and other users of engineering services to pool their studies on effective utilization. It is encouraging to note that a number of state societies and state universities are scheduling additional such conferences through the fall and winter.

MILLER

(Continued from page 27)

Mackinac Bridge for Aerodynamic Stability (1957).

Manson Benedict's papers on extractive and azeotropic distillation, and his articles in *Encyclopedia of Chemical Technology*, have secured a place for him in the permanent literature of chemical engineering. Some of O. H. Ammann's reports—especially his *Tentative Report on the Hudson River Bridge* (1926)—are used by teachers of technical writing as excellent models of graceful style and double-report form. Arthur E. Raymond's *Well-Tempered Aircraft*, which develops a brilliant philosophy of engineering administration in a sustained analogy to Bach's Well-Tempered Clavichord, was hailed as a classic when delivered at an international conference in 1951. And of course, with the new specialization of "technical writing," with some engineers working full-time on literary problems of their firms, we may expect improvement in the general level of engineering literature and perhaps some of the greatest engineering writing yet.

6. Engineers As Popular Writers

With such talent in exposition, many engineers have taken the next step and written for the general public. The popular encyclopedia, the magazine, the non-fiction book are natural media for engineers proud and able to tell the world about their profession. Rankine authored the first popular article on "The Mechanical Action of Heat" for *Nichol's Encyclopedia*. H. S. Person composed a classic explanation of "Engineering" for *Encyclopedia of Social Sciences* (1935); although outdated in its optimism about the Soviet experiment, this essay is the layman's best introduction to engineering problems and techniques. D. H. Killeffer has put out a whole series of popular books on chemical engineering; his best is *Two Ears of Corn, Two Blades of Grass* (1955) which explains to frightened laymen the bright side of the nuclear age.

History and autobiography—professional and personal narrative—

are the forms of popular writing in which engineers enjoy the most reliable success. Robert H. Thurston's *History of the Growth of the Steam Engine* (1878) is now in its seventh edition, still a standard authority and perennial favorite. A compact, thoughtful, provocative little classic is A. P. Gest's *Engineering* (1930) which traces the profession's indebtedness to ancient Greece and Rome. William Barclay Parsons made several significant contributions to history in *American Engineers in France* (1920), *Robert Fulton and the Submarine* (1922) and especially in *Engineers and Engineering in the Renaissance* (1939, posthumously), the definitive work on the subject. The best general history of the profession is James K. Finch's *Engineering and Western Civilization* (1951) which derives an engineering interpretation of history and warns America how not to follow Egypt, Greece, Rome, France, and England into decline.

Turning to personal narrative, we find that Captain Perry published a swashbuckling story of his three years in the service of Peter the Great; *The State of Russia under the Present Czar* (1716) is still a source book on early inland navigation. John Metcalfe, blind road and bridge builder of Yorkshire (and blind combat soldier, too!) dictated his incredible *Life* (1795) which did well enough to justify a second edition (1812). Henry Bessemer's *Autobiography* (1905) is a moving story of his trials, disappointments, and triumphs; Lamme's (1926, posthumously) is an interesting study of a shy, lonely man who was terrified at being introduced to Lord Kelvin. Michael Pupin's *From Immigrant to Inventor* (1923) is of course the classic in this field, rich in introspection, analogy, anecdote, and contrast.

The engineers most ambitious and successful in writing for the general public have been Telford and Steinman.

TELFORD wrote articles for the *Edinburgh Encyclopaedia*, two chapters for a popular book on Shropshire. His poems were praised by Robert Southey, Poet Laureate, as superior to many that had won university prizes. Telford's verse-letter to Robert Burns was judged good enough to be printed in the "authorized" *Life and Works of Robert Burns* issued by Burns' literary executor. "Eskdale," Telford's best poem, exemplifies his power to reach and sustain deep feeling. His life's work is summed up in his two-volume autobiography (1838, posthumously); scanty on personal revelations, it is jammed with valuable historical information, beautiful illustrations of his major works, a selection of his better reports, and some of his poetry.

Steinman has written the current articles on "Bridges" for several standard encyclopedias; superb magazine articles on such subjects as "Beauty and Its Vocational Symbols;" and four popular books. *Miracle Bridge at Mackinac* (1957, in collaboration with J. Nevill) actually makes the most technical difficulties of this project intelligible to the public. *Bridges and their Builders* (1940, in collaboration with S. Watson) is more than a good history; it is an intellectual chronicle of the fight against ignorance and prejudice, a dedicated study of the kind of moral character that makes an engineer. Steinman has also used verse as a medium for perspective on his life and his world; he has published a small volume and won several respectable poetry prizes. Like Telford, he has earned the praise of professional poets; Marianne Moore, for example, has enjoyed his "concept of the bridge as a 'rainbow'." Steinman is at his best in his intellectual and narrative poetry, in which he speaks trenchantly of evolution, racial discrimination, symbolism of the bridge.

7. Conclusions

Reading even the few writers discussed here, we realize that the profession of engineering enjoys proud literary traditions. Engineers have devised efficient structures for their reports, papers, treatises. They have met brilliantly the public challenge to defend and explain their work in print. They have not only developed a science of engineering but have also contributed to the philosophy of science and the history of ideas. And many engineers have displayed in their writings that distinctive mark of literary talent: *style*.

In Vitruvius and Hoover, engineering has its literary equals of Hippocrates; in writers like Rankine, its literary match for Darwin. Its Plato and its Russell are yet to come.—**End.**

This Month's Author . . .

Mr. Miller

Walter James Miller has taught technical writing at New York University, Colorado State University, and the Polytechnic Institute of Brooklyn. His own publications, ranging from poetry to radio journalism, include articles on engineering literature and the book *Engineers as Writers* (with L.E.A. Saidla; D. Van Nostrand, 1953).

Now associate professor of English at New York University, Mr. Miller heads the program of basic communications courses in the Division of General Education.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233.)

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2. The owner is: National Society of Professional Engineers, 2029 K St., N.W., Washington, D.C.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relations, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed through the mails or otherwise to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semi-weekly, and tri-weekly newspapers only.)

KENNETH E. TROMBLEY, Editor

Sworn to and subscribed before me this 6th day of Oct. 1958

(SEAL) MILTON F. LUNCH

(My commission expires September 14, 1962)

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Progress in Products

BRITISH THEODOLITE — Item 30

A British theodolite for the American engineer and surveyor has been introduced. The theodolite reads directly to twenty seconds of arc and by estimation to five seconds. Among its outstanding features are the brilliance of field of the circle-reading microscope, high degree of magnification which can be applied to the graduation system, and the extremely convenient reading position.

ROOF PANELS — Item 31

Patio giant-size prefabricated roof panels have been introduced by the Hess Manufacturing Company. Each panel is two feet wide and there is no reasonable limit to its length. 6′, 8′, 10′ and 12′ panels are now available from stock. Longer panels are made on special order. Strength to meet the building code snow-load requirements of northern cities is provided by the balanced sandwich construction. A rigid under-skin of fibre board is bonded to each side of a strutted core of kiln-dried fir. Patterned aluminum sheet is applied to each side of the panel. This entire assembly is then bonded together under heat and pressure into a single unit.

AUTOMATIC TRANSLATOR — Item 32

Recently announced is a new Terrain Data Translator, an electronic device that automatically translates terrain measurements from an aerial stereo photo to digital data, ready for direct input to the computer. It eliminates complicated field surveying and in-office transcribing. The entire assembly is easily installed, and requires no special training or skills on the part of the average stereoplotter operator, it is claimed.

PAPER DRILL — Item 33

A unique, new Twin-Plex Paper Drill facilitates punching and binding of large, bulky, hard-to-store papers such as engineer's drawings, prints and plats, has been announced. Designed to punch holes that accommodate standard metal binders and binding clips, the Twin-Plex is capable of drilling up to seventy-five prints or drawings at one time. Two quarter-inch hollow steel drill heads with beveled cutting edge are set on 2¾ inch (seven centimeters) centers and are individually manipulated by convenient hand operated screw mechanisms.

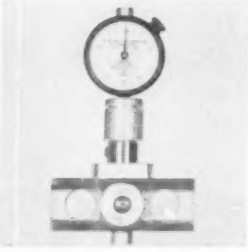
FILM MOUNTING — Item 34

Snap-Jacks, a device for mounting individual microfilm images in a filing card, has been announced. It is possible to remove a specific filmed document from a roll of film, insert it quickly into the Snap-Jack pocket which in turn snaps into any type of filing card with a pre-cut aperture. The Snap-Jack itself is a transparent triacetate holder into which the film is inserted, accommodating an image of 16mm, 35mm or 70mm film.

DIAZO PRINTER — Item 35

The 1959 models of the Blu-Ray Rotary Diazo Printer has been announced. The models incorporate several modifications, all contributing to increased speed and convenience, it is claimed. Printing speeds are said to have been stepped up fifty per cent by a revision of the light source and with an air cooling system to control interior temperatures and maintain optimum lamp temperatures for maximum efficiency and usable life. A belt and pully drive has improved paper feed. The machines are available in 42″ and 22″ sizes.

AMPLIFIER INDICATOR — Item 36



A gage assembly has been developed to permit many close tolerance checks in the production room, or on the inspection bench, that were formerly limited to the laboratory. Direct dial indicator readings in increments of .00002″ are now possible by the combination of a rugged indicator gage with a patented mechanical amplifier already in wide use. It is also available for readings down to .0001.

MEMO CALENDAR — Item 37

A novel 1959 calendar, planned and copyrighted specially for use by architects, engineers, contractors, and other construction industry professionals, has been designed. Featuring utility rather than decoration, memo calendar is suitable for use on either wall or desk. Large spaces are provided for daily memoranda. At the end of the year, the calendar provides a useful permanent record of the year's activities, as it folds in book form to legal-file size. Folded, it also is easy to carry in a brief case. Each page shows four full weeks, successive weeks being shown without interruption at the beginning and end of a month.

This column describes new products of general interest to professional engineers. For further information, circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

These listings are informational and are not an endorsement of the products, nor of the manufacturer's claims.

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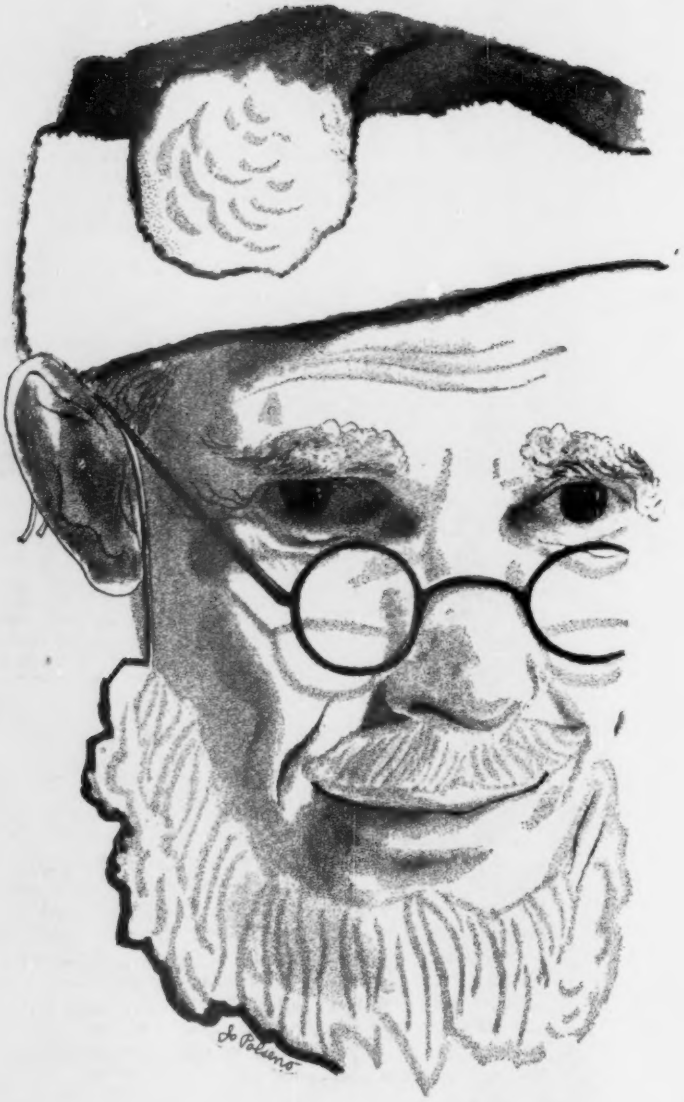

"This Christmas check is wonderful," our office Santa Claus told us last year while he was making up for the office party. "But you should have enclosed an application card for more U.S. Savings Bonds on our Payroll Savings Plan. The time to persuade me to *invest* money is when I *have* money."

That was such a sound idea that this year all our Christmas checks to employees will be accompanied by a Payroll Savings card and the suggestion that the recipient sign up immediately for the regular purchase of U.S. Savings Bonds through the coming year.

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